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FOR THE AWARD OF DEGREE
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IN

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ASSESSMENT OF THE NORMAL THICKNESS OF ADRENAL GLAND [MDCT] IN WESTERN UP POPULATION

BY

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ON

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SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE AWARD OF THE DEGREE

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In

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By

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LIST OF FULLFORM

Sr.No	FULLFORM	ABBREVIATION
1	KILOVOLTAGE POWER	KVP
2	MILI AMPIARE SECOND	MAS
3	ADRENAL GLAND	AG
4	MAXIMUM	MAX
5	LATERAL	LAT
6	MULTIPLANAR RECONSTRACTION	MPR
7	MAXIMUM INTENSITY PROJECTION	MIP
8	THREE DIMENSIONAL	3D
9	RIGHT ADRENAL GLAND	RAG
10	LEFT ADRENAL GLAND	LAG

CHAPTER -01

INTRODUCTION

1.1 Adrenal Glands (Suprarenal Glands)

An important component of the adrenal cortex is the adrenaline glands, also known as the parathyroid gland. The brawl reaction the adrenal glands have a significant impact on the organism. cortex. They produce stress levels, which trigger biological adjustments required to counterbalance changes in their surroundings. The body's human Several essential factors play a crucial role in regulating the body, metabolism, and salt and water balance chemicals that the aldosterone also produce. The paired adrenal glands are pentagon-shaped, 5 cm by 2 cm in size, and weigh 4 to 5 grammars apiece. They are located on the surface of each organ.

The aldosterone are crucial to the body's endocrine and biological conditions. They were first defined in 1563 by the researcher Eustacius. They are triangular-shaped sex hormones that are situated suprarenally at the stage of the L1 spinal column and on the posterior edge of each nephron. The left gamete is shaped like an inverted V or Y, an L reversed or reversed; it might even be pointed. Averted V or Y shapes can be seen in the right adrenal gland.

In both sexes, the average The average adult adrenal gland weighs 4 grams. The adrenocortical gland's superior-inferior size varies, but n range from 2 to 6 cm.

Adrenal glands typically have a thickness of 5 to 6 mm, rarely 10 mm. Dimensions and shape of the adrenal glands will be influenced by something like a number of neural activities & clinical manifestations, such as mortgager and other diseases, nosocomial granulomas granuloma and various thyroid problems.[1]

1.2 Structure and Function

The location of the adrenal cortex is close to vital organs and veins. On each side of the body, the two endocrine medulla are perched above the kidneys. They rest in the perinephric area, surrounded by the upper kidney ligament. The volume of the adrenal cortex at infancy is approximately each that of the organ, but by maturity, they are barely linear the volume. Each adrenal gland is located in the perineal area on top of the kidney, across from the clavicle and the beginning of the 11th subcostal gap. The left ramus gland is shaped like a crescent, whereas the right ramus gland has a decentralized system. 50 mm, 30 mm and 10 mm in length, width

and thickness respectively are the dimensions of each gland. The average gland weights 5 grammes.

Anatomical Relations

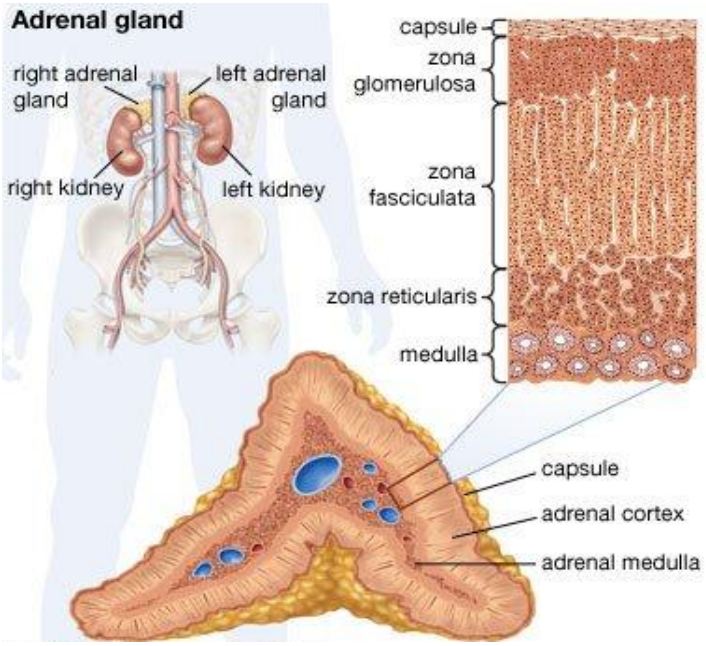
The right kidney gland is located proximal to the diaphragm, behind the inferior of the vena cava, and immediately well below liver. The left adrenal s located proximal to the abdomen, lateral to the abdominal aorta, above the pulmonary artery to organ.[1]

1.4 Internal Structure

There are two, the renal medulla and the outer cortex. Various tissues that make up the endocrine system. The adrenal medulla appears reddish-brown in color. The whole adrenal gland is encased in a capsule of substantial connective tissue.. In comparison to the com parisonlla, which makes up just around 15% of the duct, the adrenal cortex is significantly bigger. It is separated into three different sections:

- (Outer layer) Zona Glomerulosa
- (middle layer) Zona Fasciculata
- (inner zone) Zona Reticularis

Picture-



1.4 Embryology

Two embryologically distinct tissues that contain two different types up the cortisol signalling . One is the mesenchymal partments cells, which creates aldosterone. The other is a neuroectoderm-derived medulla that emits adrenergic receptors.[1]

1.5 Blood supply and Supplytics

The adrenal glands receive their blood from three main sources:

1. The inferior small stem o the phrenic artery is known as the upper cortisol vein.

2. The thoracic duct is the primary origin of the main cortisol vein.

3. The nephron creates the lesser source's opposite cortisol vein.

The source of the cortisol vein can vary widely. The coeliac tract, abdomen aortic, or, less frequently, a subcostal vein can all be the source of the upper glucocorticoid vein. The thoracic duct or the superior parietal lobes artery are other potential sources for the inferior cortisol veins.

The aspect of the duct affects the arterial outflow from the gonads. Due to its physical distance from the superior vena cava, the left cortisol gland's vein empties into the left venous system.

The apocrine vein drains directly into the superior vena cava, which is much nearer. Adrenal superficial veins frequently differ, especially on the left side. Sources claim that veins connect the left vaginal and adrenal veins with the inferior phrenic vein. Left fat fact, and left glucocorticoid veins are quite prevalent.[1]

1.6: Nerves system

Both neural and pharmacological stimuli influence the cortisol gland's ability to operate. The posterior pituitary gland secretes hormones aldosterone hormone (ACTH), which stimulates the adrenal cortex. The corresponding cortical zones are then activated by ACTH to produce cortisone. Primary afferent nerve fibres (type B)fibersthe T5-T8 spinal cord sections arise from the fitted with two structf the extstructuresn of the spinal cord and muscle fibres the endocrine lobe instead. Without going through the paravertebral sympathetic ganglion loop, these neurones create the neurons splenic neuron. A few of the larger splenic nerve's nerve fibres make connect if berth the coeliac ganglia. The presynaptic fibres of the duo will then innervate the bloodstream arteries feeding the adrenals. However, part of the greater splanchnic nerve's fibres by pass the fibers bypass and enter the endocrine system straight, where they connect with the coats of the hypothalamic neurons. The cortisol cortex functions as a hormonal connector between the different biological parts because of this. The cortex cells, which appear to function as a unique variety of neurone, discharge effect straight into the bloodstream to cause a generalised positive reaction.[1]

1.7: Surgical considerations

Before manipulating the cortisol cortex to remove a pituitary adenoma, a hormonal tumour based on cells that make copious amounts of monoamines, the cortex cells, it is essential to bind the central vein. The reverence can discharge considerable amounts of adrenergic receptors into the circulatory system if the cortisol vein is not fused before moving the gland. This generates a dopamine rush, which causes a quick onset of severe hypertension and tachycardia. It is generally known that ectopic glucocorticoid tissue exists. Assessing any aberrant tissue is crucial if the adrenal cortex is to be surgically removed. Ectopic cortical tissue is frequently found in the hip or close to the renal. Along the progenitor cell cells' downward trajectory, there is abnormal thalamic cells.

A procedure known as adreno hepatic union allows the endocrine glands and liver to join. This union can make it more difficult to perform the correct spreading since it increases the risk of releasing glandular tissue. Retinal arterial management will frequently be required in this situation to limit excessive bleeding and/or liver damage during the tumour excision of the glands.

When surgery is either not necessary or judged risky, vascular ablation can also be used to treat adrenal tumours. For patients who want to stop treatment, indications include palliative pain treatment, tumour following heavy, adrenal haemorrhages, and skills and improving hormonal tumours.[1]

1.8: Clinical significance

The usage of cholesterol by the adrenal cortex as a crucial hormone precursor is remarkable.

The following happens as a result of pathological occurrences in the cortical zones:

- Zona Glomerulosa: Frequently demonstrates, which activates the kallikrein system, is a symptom of Conn disorder (RAA). This situation leads to persistent pressure in the patient, who is normally taking three generally pro. Usually, test result would show metabolic alkalosis and moderate electrolyte imbalance.

- Zona Fasiculata: Pituitary illness causes stomach striae with considerable central adiposity, a bull hunch at the nape of the neck, and hyperglycemia as a result of increased cortisol levels. Poor healing is one of the other characteristics.

- Zona Reticularis: Adolescence in men or the virilization of young females with androgenic traits are two symptoms of short stature.

Cortex cells are specialised cells found in the adrenal medulla. Surrounding vascular system, these cells congregate in small clusters. The medulla's cortex cells produce adrenaline and adrenaline. These autonomic peptides have a wide range of biological functions, such as influencing the "fight or flight" response, raising heart rate, heart contract force, metabolic rate, and alertness. These autonomic chemicals are involved in a variety of biological processes, such as the "fight or flight" reaction, raising heart rate, heart contract force, metabolism, and raising consciousness levels.[1]

1.9: Other Issues

Adrenal Incidentaloma

- These can affect up to 4% of Ct scanners and occur more often than anticipated.
- If a person has a family history of breast cancer, a biopsies may be recommended.
- The presence of a healthy pituitary hyperplasia must be ruled out if the individual has no core malignancy.

The question of whether the tumor is functioning is addressed in an algorithm for adrenal incidentaloma.

Take the proper testing process for the adrenals, such as the low dose cortisol test, plasma strategy. This strategy, and plasma cortisol. If they are, the client probably needs a spreading.

Consider the possibility of spread if the tests are negative. Exists a primary cancer history? Can a biopsy confirm metastatic illness if the answer is yes? An adrenal incidentaloma should not be biopsied unless there is a previous source of cancer because this could result in the spread of an adrenal gland carcinoma into the tissue fluid. The most frequent source malignancies to metastasize to the kidneys are breast and pulmonary cancer. [1]

Resume the CT in four to six months if there is no prior history of malignancy and the adrenal incidentaloma is smaller than 4 cm. Perform a functional workup and considering spreading if it is greater than 4 to 6 cm.

Non-functional masses are identified by the metabolic workup.

These masses typically measure less than 4 cm.

Intervention, whether medical or surgical, is necessary to maintain a functional mass that generates effective hormones. They consist of:

- (G) Conn syndrome: elevated aldosterone
- (F) Cortisol elevation: Cushing syndrome
- (R) Increased androgens: early puberty[1

CT Introduction

Computed tomography is a modality used in radiology department which uses ionizing radiation to produce cross sectional images of an object.

1.11: HISTORY

In 1960's electric and music industries (EMI), who also owned the Abby road, studies used the **Beatles** concert to raise funds for the research of the first EMI Scanner. British Engineer Sir **Godfrey Newbold Hounsfield** was the person who is given the main credit for the innovation of CT scan along with him physicist **Dr. Allan Cormack** also gave a huge contribution in the development of CT scan.[2]

The word tomography came into existence in early 1920's which was used to describe body section radiography. Later in 1935 Sir Grossman labelled tomography as section. Watson in 1937 developed a technique in which the section were cross-rational and it was referred as transverse axial tomography. However due to lack of details and clarity in the images they were of minimum use in diagnostic radiology. Along with these developments several mathematical algorithm were also innovating which were designed to reconstruct image of an object from multiple projection. Combining all the mentioned innovations in 1967, Hounsfield merged reconstruction techniques to tomography equipment's and presented the world's first clinically useful CT Scan which was used for the imaging of Brain.[2]

In the early CT scan different methods were used for imaging, like in some the X-ray source was placed inside the patient and in some the X-ray source was outside the patient similar to an X-ray machine. In 1973 Hounsfield published his research in the British Journal of Radiology and named it Computerized Transverse axial scanning. Apart from this many other names were also given to the CT scan like Computer assisted tomography or Computerized Trans axial, Transmission reconstructed tomography and many other. Finally the phrase **Computed tomography** was marked by radiological society of North America (RSNA) and accepted worldwide. EMI Lab presented the first EMI scanner in the year 1972. SIR GODFREY

HOUNSFILED and Dr. ALLAN CORMACK were jointly awarded for this innovation in the 1979 Nobel prize in physiology and medicine. [2]

1.11 Principle of computer tomography

CT overcome the constraint of clarity and detail image reconstruction mathematical composition anatomical picture of the cross section from projection to rigid and clear reconstruction of an image in 1917, the number of forecasts had its theoretical beginnings .when Radon, Austrian mathematician, demonstrated that 2D pictures or 3D objects may be rebuilt or created from numerous projections from various orientations. This method is used in a variety of domains, including astronomy and electron microscopes; for example, in astrometry, the picture of the sun was recreated, and the image of the bacterium's molecular structure was reconstructed under the microscope.[3]

Image of the human body can also be reconstructed use multiple projections of another place. Simply put radiation penetrates all sections of a particular section Projected on the detector to send a signal to the computer for processing. Computer produces a rigid image of the interior construction of the object. A more absolute clarity of this approach given by Herman (1980), who stated: "Reconstructing an image from a projection is a process create a 2D image. Distribution (usually physical characteristics) Estimating line integrals along a finite number of a line in a known location. Computer tomography scanner used this process produces a variety of image. From 2D and 3D section image to virtual images realistic images of anatomy or organ system in research. Finally, reconstruction of image from projection experimental in medicine in the 1960s aling the effort of researchers like Oldendorf, cool, Edwards studying issue of nuclear medicine. In 1963, Cormac also used reconstruction technology manufacture the world's first clinically usable CT scanner these studies for brain imaging have ensured in two types of computer tomography system. Emanation computer tomography with radiation source inside transfer with patients (nuclear medicine, etc.) CT With external radiation source. The patient's (eg, X-ray images). Both contain images reconversion was also done utilize in medical diagnostic ultrasonography and testing magnetic Resonance Imaging (MRI). [3]

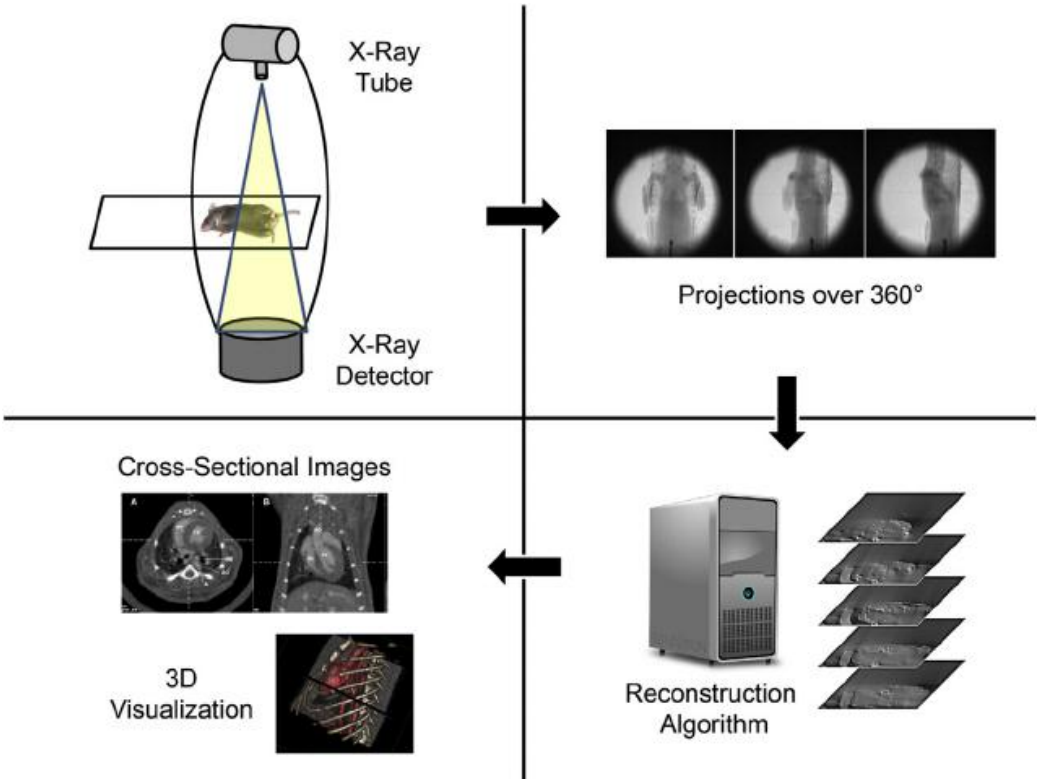


Fig 1.6: IMAGE RECONSTRUCTION FROM DIFFERENT PROJECTION

1.12: EMI SCANNER

EMI scanner were originally designed specifically to evaluate the brain. In EMI, the head is locked in the water bath between the X-ray tube above and one detector pair below. One third, a reference detector, partially blocked beam before it reaches the patients. A reaches the patient. A rigid scanner maintains relativity position of the x-ray and detector and ensures they are properly aligned. The x-ray beam has been precisely collimated size of two detectors side by side. Patient remains in position during the scan. Moving tube by two different categories of motion, one linear and other rotatio , Linear motion is repeated and more than 180 time. between every 180 straight motions, the truss has rotated 1degree. therefore , the total rotational motion includes 180 degree semicircle. Rotary go through the patient center to manage. The x-ray beam was “on” transparent motion straight and “off” in rotational movement. Transmission radiation measures 160 time in each rectilinear motion .Frequency of transmission measurements in total is the product of the number of linear measurements (160) and non-rotating (180) was 28,800 in the original EMI scanner and total analysis time is from 4.5 and 5 minutes. Simultaneous scanning each time examined two sections of tomography, one part

from each paired detector. A lot of photographing sections are required to most patients, usually up to ten. Each pair pf tomography sections has 5 minutes, such that the total analysis time for one study for about 25 minutes. X –ray tube coupled detector move continuously and in unison for straight sweep movement. they did does not stop for 160 read transmission. The transmission reading represent a mixed all element in the radiation path's absorption characteristics.[3]

Fig 1.7 THE SCANNER GANTRY

1.13: ACQUSISTION OF CT DATA

The word “data collection” mention to the measuring of a patient’s X –ray transmission. They found specific electronic detectors that assess transmission value or attenuation

value after the X-ray has gone through the body. To comply with the rebuild criteria, sufficient measurement or transmission data must be recorded. The first brain scanner to adopt the data gathering technique in which the tube of X-ray and detector as they move from left to right, they could either travel in a single direction or move across the patient’s head to get infusion amount information. The tube of x-ray and detector than rotate 1 level and return to the skull of patients, this time from right to left. Scanning is a rotational operation that is done 180 degrees.[3]

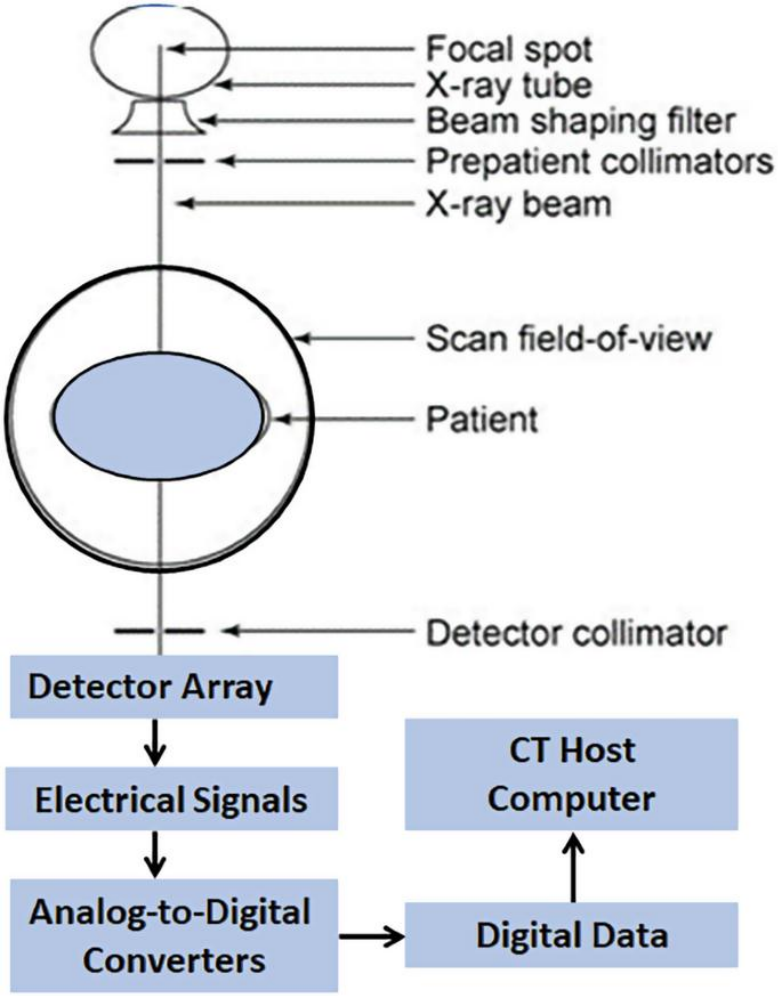


Fig 1.8 The Data Acquisition In Computed Tomography

1.14: The Data Acquisition in Computer Tomography

The main issue with this approach is the amount of time it takes to collect enough data to rebuild the image. More efficient programmer for scanning patients were introduced a short time afterwards. These modes are associated with the even as patient moves through the scanner, the x-ray tube and detector revolve simultaneously at the same time. This method result in the digitization of a larger rather than a single slice of tissue, a volume of tissue is used like the original CT scanner did. Mass analysis is now used to describe having only one tissue volume during scanning.

The helical trajectory recorded by an X -ray beam is produced by the constant rotation of detector and tube, as well as the patient's movement. Volumetric analysis has two goals: to increase the pace of covers as well as the provide better features for clinical applications Data collection includes converting electrical signals received from electronic equipment to digital data detectors that computer can use.[3]

1.15: HELICAL OR SPIRAL COMPUTER TOMOGRAPHY

This is possible with help of slip ring technology, where the X-ray tube in the CT table are continuously incrementing and continuously rotating. This causes the tube of X-ray to form a fictitious spiral or spiral path around the CT patient.[4]

1.16: MULTI-SLICE COMPUTER TOMOGRAPHY

Multi-slice CT (MSCT) is a scanning operation provide by multiple sets of indicators to generate perceptions associated with different segments. This system has characteristics that are incompatible with standard scanner placements, so individual screening indicators must be used. This pioneering achievement of this forehead display mode, which includes federation in addition to complex questions, significantly facilitates this performance of the scanner in the direction of the phase in terms of perceptual scale, learning time, and interpretation.[4]

1.17:MULTI-DETECTOR COMPUTER TOMOGRAPHY

When using multiple detector arrays, the collimation array is wider and uses the number of photons provided by a specialized X-ray device to generate evidence of perception. When starting a collimator with a single array scanner, the slice thickness tends to increase, minimizing image quality in the pixel size dimension. For some detector array scanner, the slice thickness is determined by the size of the detector, not the collimator.[4]

1.18: IMAGE RECONSTUCTION TECHNIQUE

Image similar is a geometric process that comprehensively guides the perception of the evidence of numerous ray prominences to several different gradients through the victim. Algorithms are geometric

processes used to solve the problems. Describes the followings triangulation techniques for perceptual recovery.[5]

- **BACK -PROJECTION:** Demands rarely stands out backwards, but it is “approaching sum” , meaning the most outdated means of reshaping prescription . None of the CT scanner on the market use simple back projection, but I’ll use it as a prototype because it’s the easiest way to explain this.

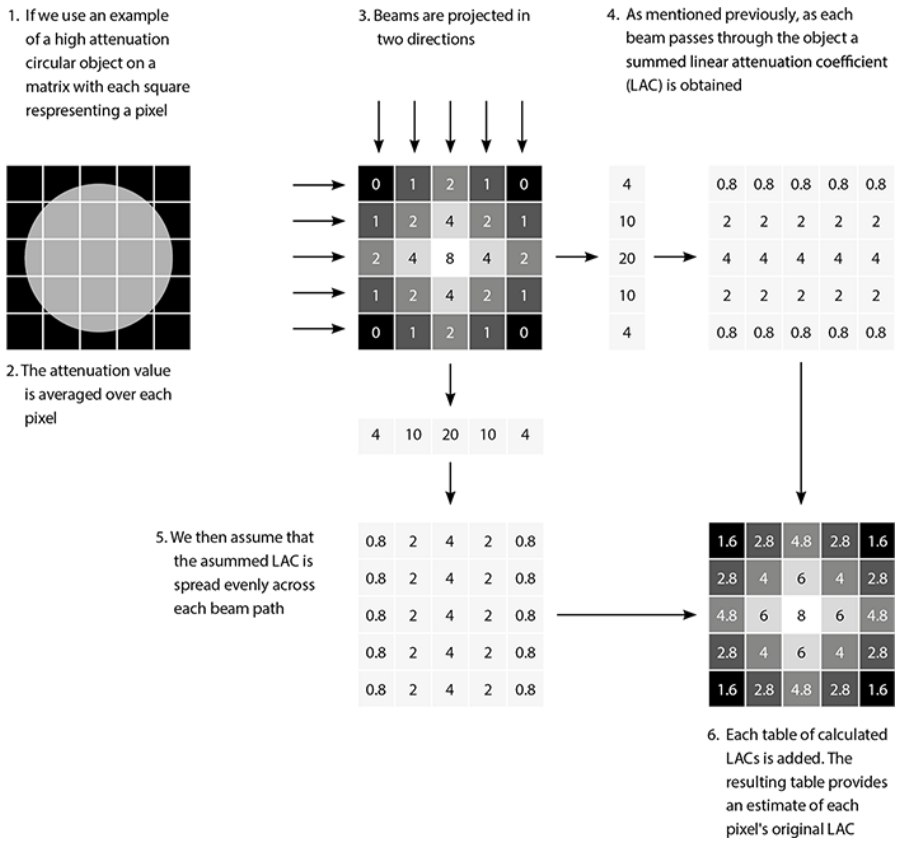

1. If we use an example of a high attenuation circular object on a matrix with each square respresenting a pixel
2. The attenuation value is averaged over each pixel
3. Beams are projected in two directions
4. As mentioned previously, as each beam passes through the object a summed linear attenuation coefficient (LAC) is obtained
5. We then assume that the asummed LAC is spread evenly across each beam path
6. Each table of calculated LACs is added. The resulting table provides an estimate of each pixel's original LAC

Fig 1.9: BACK PROJECTION

- **ITERACTION METHODS:** Repeated mods start next to assumption that are specified only within each pattern, for example. Also, the above assumption are calculated next to the contained characters so that these pairs can be repeated in the communication and wait for future expectations. Moral. There are three variations of iterative reconstruction, depending on whether the correction sequence contains an entire matrix, a ray, or a single point.[5]

- **SIMULTANEOUS RECONSTRUCTION:** At the beginning of the iteration , all estimates are determines for the entire matrix and all improvement are made for each interaction at the same time. The

single ray calculation is highly valued , the repaired improvements are integrated into the next ray calculation, and each interaction repeats the progression of the individual ray.

- **POINT CORRECTION:** Measurements and corrections are arranged to allow all ray traveling within individual duration. In addition , this improvements recently effected the supplementary clause, and this has been reproduced for all durations .
- **SYSTEMIC PROCESS:** The systematic process was the last process to work on any device today. These algorithms transform the iterative process into the exact specifications recently used in connection with these scientific rehabilitations. These formulas are surprisingly complex for most radiologist, but mathematicians say they are actually quite simple. we will only try to illustrate two common analytical methods ,two dimensions Fourier decomposition , including sophisticated celebrities . all the foundations of Fourier analysis mean that virtually any number of frequencies and loop ratios can achieve all objectives over time. Penetrating back projections is comparable to prominence without future penetration of perception, and conversely in mitigated by targeted compensation.[5]

1.19: VOLUME IMAGING: its important note to mix it up with volume rendering. Virtual reality is type of estimate imaging, whereas volume imaging creates a true three dimensional visualisation mode. These innovation explored include holography, stereoscopy displays anaglyphic approaches, varifocal mirror, Synthalyzers, and rotating multi diode arrays.[3]

1.20 : 3D MEDICAL IMAGING: Doctor gasor herman of the Pennulsylvania university's medical imaging processing group explain medical imaging in 3 dimensions as "a process that begins with a stack of selections slices collected by some medical imaging devices and ends with computer generated displays that facilitate the visualisation of underlaying spatial relationships" according to uddupa and herman (2000), the team 3d imaging refers to four types of three dimensional operations "processing, visualization, manipulation, and analysis.

1.21: VOLUME RENDERING: When compared to surface rendering techniques, it is a more advanced technology for creating three dimensional photography with superior image resolution and more data it solved some of the constraints of surface representation by using the whole data set from 3d space. As a consequence, volume rendering need more processing power and is therefore more effective then surface rendering. [3]

CHAPTER -2

AIM AND OBJECTIVES OF THE STUDY

2.1 : AIM: Assessment of the Normal thickness of Adrenal gland [MDCT] in western UP population

2.2 : OBJECTIVE :

- To determine the left and right adrenal glands' natural thickness (AG)
- To assess how it relates to factors including gender, age, height, body mass index (BMI) and weight.

CHAPTER-03

REVIEW OF LITERATURE

3.1.Karun Devkota et al. (2023) conducted a study on "Normal Adrenal gland Thickness on computed Tomography in Nepalese Adults Presenting to Tertiary Referral Hospital" to evaluate the normative measurement of adrenal gland thickness and its variation among age and gender. They published their study in Medical Journal of Shree Birendra Hospital, which is indexed in Crossref. They found out that the adrenal body on the right side showed a significant difference between sexes, with values slightly higher in males than in females. However, no significant differences were found in adrenal limb thickness when compared by sex. The mean thickness of the adrenal glands and diaphragmatic crus was measured, with significant differences observed between the right and left sides. Specifically, the left side parameters were generally larger than those on the right side, with a notable difference in the thickness of the right and left diaphragmatic crus. The study found that the adrenal limbs and body on both sides did not show any significant correlation with age. In conclusion, the study established reference values for normal adrenal gland thickness in the Nepalese population, which can serve as a benchmark for future clinical assessments and research.

3.2.Jeries P. Zawaideh et al. (2023) conducted study on "Imaging assessment of adrenal gland"The paper presents several key findings regarding the imaging assessment of adrenal glands, emphasizing the importance of radiological evaluation in diagnosing and managing adrenal lesions. Adrenal abnormalities are frequently discovered as incidental findings during cross-sectional imaging of the upper abdomen. This underscores the necessity for radiologists to be adept at identifying and characterizing these lesions, as they can have significant clinical implications. The paper emphasizes the importance of a multidisciplinary approach in managing adrenal conditions, particularly given the complexity and potential aggressiveness of adrenal tumors. This approach ensures comprehensive care and better outcomes for patients .

3.3 Dr. Shilpa Devakar, et al[6] (2022) conducted a study on Assessment of Normal Adrenal Gland Thickness on Computerized Tomography in a Tertiary Care Hospital of Karnataka, India. Assistant Professor, Radiological dept Karnataka, India's University of Medical Sciences. The adrenal glands are an essential component of the endocrine system, yet little is known about their normal function in the research. A particularly effective method for describing the anatomy of the glands is CT (computerised tomography). Knowing the radiographic anatomy of the

glands can help in the diagnosis of many different disorders. The goals are to the average adrenal gland size in the adult population & to analyse how age and gender relate to width. Inpatients with clinical indications other than adrenals who had upper belly CT angiography were also in this hospital-based cross-sectional investigation, which lasted a year. The analysis includes 1000 scans. In both adrenal medulla, the maximal body width and the lateral and medial limbs were measured to their long axes at right angles. The study's participants, who included 700 males & 300 females, had an age averaged to 54 - 7.5 years.Medial limb, Right adrenal gland body and lateral limb mean maximum thicknesses were 4.23 - 1.45 mm, 7.16 - 1.67 mm and 4.45 1.19 mm respectively. The left side's measures were larger than the right side in all values, which was statistically significant (P 0.001). Male and female sizes varied significantly from one another statistically. Age of the patient and all characteristics of the adrenal glands were positively correlated. We advise physicians to utilise our data as a reference when they meet a suspiciously "bulky" or "diffuse smooth expanded" adrenal gland because it provides a helpful baseline reference range for the Indian age group.[6]

3.4 Enes Gurun , et al[7] (2021) conducted a study on Utilizing Multidetector- detector CT, the volume, and normal adrenal glands morphology were assessed, as well as their relationship to waist circumference in an adult population.. Department of Radiology, Iskilip State Hospital, Turkey. In this study, the left, right and total volumes and shapes of the adrenal glands (AG) will be determined, as well as their normal range of values, and their relationships multi detector CT scan (MDCT) pictures including weight, body mass index (BMI), gender, age, height and waist circumference (WC) will be assessed. 56 men and 59 women out of the 115 MDCT scans that were part of the study. The contours of the AG were drawn moderately for each subject in order to quantify capacity. The amounts were then detected and measured after collecting the area in each segment. In order to assess intra observer reliability for multiple testing with a 95% confident interval, the intra class correlation coefficient (ICC) test was performed. We gathered the age, gender, weight, height, BMI, and WC of the individual. Statistics were judged significant at p .05. Participants' average ages were 49.5 17.7. (19–81). Mean AGV values for the right (RAGV), left (LAGV), and overall (total) directions were 3.471.33, 4.771.33, and 8.252.74, correspondingly. All measures' ICC values were between 0.80 and 0.90, suggesting good to outstanding consistency. LAGV was found to be greater than RAGV. The AGVs showed a moderately positive connection with BMI and WC. Assessment of the hypothalamic-pituitary-adrenal axis pathophysiology will be aided through the observations. Because the rise in body mass index and WC, indices of obesity, coincides with the rise in AGV. [7]

3.5.Enes Gurun et al. (2021) performed a study on "Evaluation of Normal Adrenal Gland Volume and morphometry and Relationship with Waist Circumference in an Adult Population Using Multidetector Computed Tomography" to assess the normal values of the right, left, and total volume and shape of the adrenal gland and examine its relationship with gender, age, height, weight, body mass index (BMI), and waist circumference. They published their study in The Medical Bulletin of Sisli Etfal Hospital Journal which is indexed in PubMed and Web of Science with an impact factor of 1 in 2023. They found that the most prevalent shape observed for both the right adrenal gland (RAG) and left adrenal gland (LAG) was the "Y" shape. The mean value of right adrenal gland volume was 3.47 ± 1.33, left adrenal gland volume was 4.77 ± 1.33 ml and total adrenal gland volume was 8.25 ± 2.74 ml. The study found no statistically significant relationship between gender and the mean volumes. However, it was noted that LAGV was significantly higher than RAGV. The study reported high intraclass correlation coefficient (ICC) values for all measurements, ranging from 0.80 to 0.90. In summary, the study provides significant insights into the normal morphology and volume of adrenal glands, their relationship with obesity, and the implications for clinical practice.

3.6.Dr. Shilpa Devakar et al. (2021) conducted study on " The study conducted on the assessment of normal adrenal gland thickness using computerized tomography (CT) yielded several significant results regarding the dimensions of the adrenal glands in the adult population of Karnataka, India. The mean age of the study participants was 54 ± 7.5 years, with an age range from 18 to 78 years. The study included a total of 700 males and 300 females, indicating a predominance of male participants in the sample size . The total maximum thickness of the right adrenal gland was measured at 15.84 ± 3.49 mm. For the right adrenal gland, the mean maximum thickness of the body, medial limb, and lateral limb were 7.16 ± 1.67 mm, 4.23 ± 1.45 mm, and 4.45 ± 1.19 mm, respectively. The total maximum thickness of the left adrenal gland was found to be 18.99 ± 4.13 mm, with the mean maximum thickness of the body, medial limb, and lateral limb being 8.67 ± 1.82 mm, 5.11 ± 1.24 mm, and 5.21 ± 1.19 mm, respectively .

3.7. M. S. Velema et al. (2021) conducted a study on "Volumetric evaluation of CT images of adrenal glands in primary aldosteronism" The study aimed to evaluate the effectiveness of adrenal volumetry compared to conventional CT measurements in subtyping primary aldosteronism (PA) and to assess the prognostic significance of contralateral adrenal size after unilateral adrenalectomy (ADX) The study provided several important conclusions regarding the use of adrenal volumetry and conventional CT imaging in the context of primary aldosteronism (PA). Volumetry vs. Conventional CT: The research concluded that adrenal volumetry does not

significantly outperform conventional CT in terms of concordance with adrenal vein sampling (AVS) results for subtyping PA. The concordance rates were 58.8% for volumetry and 51.8% for conventional CT, indicating that while volumetry may offer some improvement, it is not a definitive advancement in clinical practice.

3.8.Neeti Aggarwal et al. (2019) conducted study on "Computed Tomography Measurements of Normal Adrenal Glands in Indian Population" he study titled "Computed Tomography Measurements of Normal Adrenal Glands in Indian Population" presents significant findings regarding the size and shape of normal adrenal glands based on computed tomography (CT) imaging. The study included a total of 1250 patients, with ages ranging from 21 to 76 years, and a median age of 38.00 ± 7.22 years. The gender distribution was 665 males and 585 females, resulting in a male-to-female ratio of 1.14:1. he most prevalent shape observed for the adrenal glands was Y-shaped, followed by V-shaped and triangular configurations. This classification is essential for understanding the anatomical variations that may be encountered during imaging. These results contribute valuable data to the existing literature on adrenal gland anatomy, particularly within the Indian population, and serve as a reference standard for future CT evaluations of adrenal glands.

3.9.Claudia Mallol et. (2019) conducted a study on " CT characterisation of feline adrenal glands" The study aimed to characterize the CT features of adrenal glands in healthy cats, providing valuable insights into their morphology and biometry. Here are the key results derived from the paper Study Population: Initially, 30 cats were evaluated, but three were excluded due to respiratory motion artefacts and age-related concerns, resulting in a final sample of 27 cats. The population included six entire males (22%), five castrated males (19%), seven entire females (26%), and nine spayed females (33%), with a mean age of 3.8 years (range 1-9 years) and a mean weight of 4.5 kg (range 3-7 kg) Adrenal Gland Visualization Both left and right adrenal glands were visualized in all 27 cats using non-enhanced CT images. Enhanced images provided better delineation of gland boundaries, particularly in distinguishing the right adrenal gland from adjacent structures.

3.10 Reetu John, et al[8] (2018) conducted a study on On computed tomography, the thickness of the adrenal glands in adults of Asian Indian descent is normal. Radio diagnosis departments and 1 Endocrinology, Christian Medical College, India A number of physiological and pathological circumstances have an impact on the size and appearance of the AG. For a precise assessment of patients with suspected adrenal pathology, radiologists must acquaint yourself

with the normal thickness of the adrenal gland. To investigate the average adrenal gland thickness in the adult population of India using computer tomography. Study conducted in the past at a tertiary medical facility in southern India. Subjects and Approaches 586 people who received a CT abdominal angiography over a 15-month period were added in our study also patients with clinical or imaging signs of adrenal illness were excluded. Max, medial, and lateral limb thickness as taken parallel to the long axis, were among the measures taken. 51year old on average (with a range of 18 to 85). The medial, lateral limbs, adrenal body had mean maximum thicknesses of 7.2 , 4.1, and 4.31.mm on the right side and 8.8, 4.7, and 4.9 mm on the left. The total thickness of the torso and limbs on the right and left sides, respectively, was 15.6 mm and 18.4 mm. All measurements showed a statistically significant difference among the left and right adrenal glands, as well as between men and women, with the difference being higher in men. Of our patients, 27% had at least one adrenal gland body with a thickness of less than 10 mm. As a result of our investigation, As a base for subsequent study and a manual for radiology documentation, adrenal gland thickness normal range in an Indian adult population has been defined .[8]

3.11.Reetu John et al. (2018) conducted a study on "Normal adrenal gland thickness on computerized tomography in an Asian Indian adult population" to establish a baseline reference range for normal adrenal gland thickness in an Asian Indian adult. They published their study in Indian Journal of Radiology and Imaging, which is Scopus indexed with an impact factor of 0.89 in 2022-23 . The sample size of their study was 586 with means age of 51 years. They resulted that Mean maximum thickness of the body, mean maximum thickness of the medial limb, mean maximum thickness of the lateral limb, Cumulative thickness was 7.2 ± 1.8 mm, 4.1 ± 1.1 mm, 4.3 ± 1.1 mm and 15.6 ± 3.7 mm respectively for right adrenal gland. For left adrenal gland, mean maximum thickness of the body, mean maximum thickness of the medial limb, mean maximum thickness of the lateral limb, Cumulative thickness was 8.8 ± 1.9 mm, 4.7 ± 1.1 mm, 4.9 ± 1.3 mm and 18.4 ± 3.8 mm respectively. There was a statistically significant difference in all measurements between the right and left adrenal glands, with the left being larger (P values < 0.001). The study found that adrenal gland measurements were significantly larger in males compared to females. The mean cumulative thickness for the right adrenal gland was 16.6 ± 3.6 mm in males and 13.8 ± 3.1 mm in females. For the left adrenal gland, the measurements were 19.4 ± 3.8 mm in males and 16.6 ± 3.0 mm in females. The cumulative adrenal gland thickness was 2.8 mm greater in males than in females on both sides.

3.12.Duygu Akin et al. (2017) performed a study on “Morphometric Analysis of Suprarenal Glands (Adrenal Glands) with Multislice Computerized Tomography” to evaluate the shape of adrenal gland, vertebrae level, height, volume, thickness of corpus, medial and lateral branches in relation to vertebral column. They published their study in International Journal of Morphology, which is Scopus indexed with an impact factor of 0.49 in 2023-24. They took 420 scans as a sample size and found out that significant differences were found in these measurements between males and females, particularly in medial and lateral branch of adrenal gland, with males generally showing thicker measurements. A statistically significant relationship ($P<0.05$) was observed in most parameters when comparing males and females, except for certain measurements like right CTAG and IVCDAG. Additionally, significant relationships were noted between right and left side measurements across different age groups. The study found that the right adrenal gland (RAG) was predominantly "L" shaped, while the left adrenal gland (LAG) exhibited "Y" and "V" shapes. In summary, the study contributes valuable insights into the normal anatomy of adrenal glands and emphasizes the need for individualized assessments based on demographic factors in clinical settings.

3.13. Duygu Akin,et al[9](2017) conducted a study on Multi slice Computer Tomography for (Adrenal Glands) Morphometric Analysis. Necmettin Erbakan University in Konya, , Department of Anatomy Turkey Our study aims to quantify the dimensions of AG on (MDCT) images, including its shape, Spinal column height, volume, the thickness of the medial and lateral divisions of the corpus, and width from some surrounding structures, relationships of these variables according to body mass index, age, tall, and sex (BMI). A total of 420 MDCT scans from healthy subjects were used in the investigation, including 220 male (mean age: 63.44, 50-81 years) and 200 female (mean age: 61.23, 50-84 years) subjects. The thickness of AG's corpus medial section (MTAG), lateral section (LTAG), height (VLAG), adrenal gland volume (HAG), and lateral section (VLAG) were all studied. In our study, RAG was shown at the level of the 38.19% of men and 42.5% of women have T12 spine, and LAG was seen there in 39.55% of males and 51% of females. All males and 98.5% of females had RAG, and 88.63% of males and 94% of females had LAG, both of which were "Y" shaped. Male VAG were found to be lower than female VAG in each age group, and male VAG were shown to rise with age; female VAG declined in the 60–69age range and increased once more in the 70+ age bracket. The study purpose is to define the AG size normal ranges and the relationships among each of them and other factors, such as gender, age, height, weight, and BMI. [9]

3.14.Colin J. Mccarthy et al. (2016) conducted study on " Adrenal Imaging: Magnetic Resonance Imaging and Computed Tomography" The paper provides a comprehensive review of the adrenal glands, their anatomy, and the imaging modalities used to assess various conditions affecting these glands. The review discusses various imaging techniques, including computed tomography (CT) and magnetic resonance imaging (MRI), which are essential for the assessment of adrenal lesions. The paper highlights that modern CT scanners have improved resolution, allowing for the identification of small adrenal lesions with relative ease. The paper emphasizes that many adrenal lesions can be characterized noninvasively through their distinctive imaging features. For instance, adrenal adenomas typically exhibit low attenuation on CT due to the presence of intravoxel lipid, while larger lesions with irregular margins may indicate malignancy. In certain cases, invasive studies such as adrenal vein sampling or biopsy may be necessary to obtain a definitive diagnosis, particularly when the nature of the adrenal lesion impacts oncologic management.

3.15 Aline Carsin-Vu, et al[10] (2015) conducted a study on MDCT Linear and Volumetric Analysis of Adrenal Glands: Normative Data and Multi parametric Assessment From Department of Radiology, Centre Hospital University to investigate the linear and morphological measures of the adrenals, their repeatability, and connections involving the overall adrenal volume (TAV) and the adrenal micro nodularity, as well as the existence of diabetes, chronic alcohol misuse, and chronic inflammatory conditions. 154 individuals who had abdominal MDCT were included in the study. With the aid of semi-automatic software, two radiologists independently and prospectively performed measurements of the volume of the adrenal glands. Inter-observer correlation coefficient was used to study inter-observer dependability (ICC). Multivariate and multivariate analysis was used to investigate the relationships between TAV and related variables. 8.4 x 2.7 cm3 was the mean TAV. For TAV (0.97; 95% ICC was outstanding, and for linear measures, it was moderate to fair. Men, drinkers, diabetics, and those with micro nodular glands had considerably higher (TAV) than the general population. Fluid flow studies of the adrenal gland using MDCT are more repeatable than linear measures. Age, BMI, diabetes, micro nodularity, and gender all individually affect TAV [10]

3.16 Le-le Li, et al[11] (2015) conducted a study on Review of Unnecessary Adrenal Enlargement in a Chinese Population from a Retrospective Investigation from the endocrine section , Chinese PLA General Hospital, China to examine the clinical features and vital signs of accidental adrenal growth and assess the risk factors for structural lesion . The 578 patients in

this retrospective analysis had enlarged adrenal imaging characteristics. Cases of accidental adrenal hypertrophy (78) were deemed qualified. Analyzed were demographics, functional diagnoses, imaging characteristics of the adrenals, and concurrent illnesses. Each year, there were more adrenal enlargements and a higher percentage of them were accidental. The average patient age was 50.32. In 39 cases, the left side was unilaterally enlarged in 36, the right side in 3, and both sides in 39. The likelihood of routine medical examinations finding clinical onsets leading to detection was determined to be highest. The case of non-functional injuries, 12 cases of subclinical Cushing syndrome, 6 instances of main adrenal insufficiency, 1 case of metastatic, and 5 (6.41%) cases of uncertain functional ability were identified through biochemical and functional examination. Operational deficits were associated with nodular adrenal enlargement. Age and the placement of the injury were not important variables. A common radiographic result, incidental adrenal enlargement is linked to a variety of clinical variables that need to be properly assessed and managed. A risk factor was enlarged multifocal adrenal tissue.[11]

3.17.Aline Carsin-Vu et al. (2015) conducted a study on "MDCT Linear and Volumetric Analysis of Adrenal Glands: Normative Data and Multiparametric Assessment" to assess the linear and volumetric measurement of adrenal glands and published their study in European Society of Radiology Journal which is Scopus indexed with an impact factor of 4.7. They resulted that total adrenal volume was found to be 8.4 ± 2.7 cm^3, with a range from 3.3 to 18.7 cm^3. It was significantly greater in men compared to women and alcoholics exhibited a significantly larger value along with diabetic patients. It showed positive correlations with Visceral adipose tissue volume, Subcutaneous adipose tissue volume, age and BMI. In conclusion, the study provides valuable normative data on adrenal gland volumetric measurements and highlights the significant influence of demographic and clinical factors on TAV, emphasizing the superiority of volumetric measurements over linear assessments in clinical practice.

3.18. Kewalee Sasiwimonphan et al. (2015) performed a study on "Volume assessment of normal adrenal gland from computed tomography: A pilot study" to establish age-specific ranges of the volumes of a normal adrenal gland in adult Thai patients. They published their study in Chulalongkorn Medical Journal, which is indexed in Google Scholar. This pilot study evaluates the volume of normal adrenal glands using computed tomography (CT) in various age groups of Thai adults, aim to establish age-specific volume ranges. Conducted at Chulalongkorn University, the cross-sectional study involved 154 patients who underwent CT scans from September 2012 to March 2013. The study found that adrenal gland volumes increased with age, with significant statistical correlations ($P < 0.001$) observed in both male and female subjects. The research highlights the importance of differentiating between pathological adrenal enlargement and age-related changes, providing valuable data for interpreting CT scans in patients with suspected adrenal gland abnormalities. Key findings include specific volume measurements

for right and left adrenal glands across different age groups, emphasizing the utility of CT in assessing adrenal gland size and function.

3.19 Julia Schneller, et al[12] (2014) conducted a study on the volumetric and linear evaluation of the Adrenal Gland where the measurements of the Adrenals were based on MDCT . From the Institute for Clinical Radiology, Ludwig-Maximilians-University Hospital Munich, Munich, Germany. This study's goal was to provide measures of the diagonally and normal volume of the adrenal glands. This study looked at 105 people's contrast-enhanced multi detector computed tomography scans retrospectively. The linear dimensions and density of the adrenal glands as well as their volume were measured using imaging software. A second reader made the same assessment in 10 randomly chosen patients in order to test inter - observer consistency. On the left side, the mean adrenal volume was 4.84 cm3, while on the right, it was 3.62 cm3. Body weight and gender had the most effects on the total adrenal volume, with women generally having smaller glands. The endocrine gland's overall breadth was 18.96 mm on the left and 15.80 mm on the right. Volume and linear measures exhibited a strong association. Both endocrine glands' average densities were (19.64) HU. Generally, linear measurements had low inter - observer reliability while volumetry had excellent inter observer reliability (left adrenal, right adrenal). We provide typical volumetry and linear measurements data. There is agreement between linear and proportional evaluation. Volumetry, however, is more repeatable. [12]

3.20.Julia Schneller et al. (2014) conducted a study on "Linear and Volumetric Evaluation of the Adrenal Gland—MDCT-Based Measurements of the Adrenals" to provide robust baseline data regarding the volumetric and linear dimensions of normal adrenal glands using modern multidetector computed tomography (MDCT) techniques. They published their study in Academic Radiology Journal, which is indexed PubMed, Scopus, Web of Science and UGC care database with an impact factor of 3.75 in 2022. They found that the mean adrenal volume was found to be 4.84 cm^3 (±1.67) on the left side and 3.62 cm^3 (±1.23) on the right side. The total adrenal volume was significantly influenced by body weight ($P < 0.001$) and gender, with females exhibiting smaller adrenal glands compared to males. The total width of the adrenal gland was measured at 15.80 mm (±3.05) on the right side and 18.96 mm (±3.37) on the left side. There was a significant correlation between volumetric measurements and linear dimensions ($P < 0.001$), indicating that as the volume increases, the linear dimensions also tend to increase. In conclusion, the results indicated that females had thinner adrenal limbs and smaller corpus sizes compared to males, which aligns with the observed differences in volume this study provides essential normative data for both volumetric and linear assessments of

adrenal glands. This highlighting the importance of using modern imaging techniques for accurate evaluation.

3.21 Y.Z. Tang, et al[13](2013) conducted a study on The frequency of unintentionally discovered adrenal enlargement on CT London, UK: the London NHS Trust, Radiology Department. To evaluate the incidence of adrenocortical hyperplasia and the rate of department of identification. Between February & April 2011, every (CT) adrenal glands test examined those with known disease processes malignancy, abdominal injury, or endocrine disorders were not included in the study. If the adrenal gland's body was larger than 10 mm in diameter or if one of its limbs was longer than 5 mm, it was considered oversized. The total number of CT studies that were acceptable throughout this time was 564. A prevalence of 11.3% was determined based on a total of 64 cases with accidental adrenal hypertrophy. The contemporaneous CT report contained only nine cases. According to the study's findings, inadvertent adrenal enlargement is significantly more common than previously thought. According to the study's findings, inadvertent adrenal enlargement is significantly more common than previously thought.[13]

3.22.Ellen Marie Freel et al. (2013) performed a study on "Assessment of the accuracy and reproducibility of adrenal volume measurements using MRI and its relationship with corticosteroid phenotype: A normal volunteer pilot study". They published their study in Clinical Endocrinology Journal which is indexed in UGC care and Scopus database with an impact factor of 3.18 in 2023-24. The study found a correlation between mean adrenal volume and plasma glucocorticoids ($r = 0.523$, $P < 0.05$) and aldosterone ($r = 0.515$, $P < 0.05$). Mean adrenal volumes calculated in the subject group ranged from 3.99 to 5.82 ml. Intra-observer coefficients of repeatability (CoRs) for the phantom data ranged from 0.23 to 0.43 ml, while the interobserver CoR was 0.48 ml. For the subject group, intra-observer CoRs varied from 0.27 to 1.94 ml, with an interobserver variability of 2.73 ml. The findings support the notion that while MRI can be used to assess adrenal volume. The preliminary evidence of a relationship between adrenal volume and plasma corticosteroid concentrations warrants further investigation.

3.23 Xuan Wang , et al[14] (2012) conducted a study on the assessment of normal volume of adrenal gland on a 64-slice CT. Department of Radiology, Peking Union Medical College Hospital, Chinese .To assess the link between the age, sex, and physical size, as well as to look into the connections between the adrenal volume and various metrics in healthy Chinese

individuals using 64-slice multi - detector CT. This study used 125 obtained 64-slice CT images of the upper abdomen that were contrast-enhanced. The final research group had 81 person (49 mans, 32 women's). Images of the phase were portal venous examined for the findings. The thickness and reconstruction interval were both 1.5 mm. To determine the volume of each adrenal gland, its outline was manually calculated with computer assistance. Each adrenal gland's maximum sectional area, length, width, and thickness were measured. The age median of the entire sample was 47.9 years (from 20 to 76). The volumes of the total, left, right of the adrenal glands were 4.23 cm3, 4.26 cm3, and 8.50 cm3, correspondingly. Weight (r=0.381, 0.389, and 0.437, respectively, height, and body surface area all contributed to an increase in these quantities. After using the General Linear Strategies and methodology to lessen the impact of weight, there was no significant difference in the left, right, or total adrenal volume with regard to sex, and the volume did not change significantly depending on age. Except for thickness and width in the left side, almost all characteristics of bilateral adrenal glands linked with contralateral size. In both the lef and right adrenal glands, length demonstrated a greater connection with volume than the other variables. Our study established the volume distribution and other characteristics of healthy adrenal glands in Chinese people, setting the stage for subsequent research [14]

3.24Xuan Wang et al. (2012) performed a study on "Evaluation of Normal Adrenal Gland Volume by 64-slice CT" to measure the volume and other parameters of normal adrenal glands in Chinese adults using 64-slice multidetector CT. They published their article in CHINESE MEDICAL SCIENCES JOURNAL, which is indexed in PubMed with an impact factor of 0.60 in 2022-23. They resulted that the left adrenal gland volume was measured at 4.23 ± 0.74 cm^3, with a range of 2.85 to 5.83 cm^3. The right adrenal gland volume was found to be 4.26 ± 0.86 cm^3, ranging from 2.59 to 6.56 cm^3. The total adrenal gland volume was calculated to be 8.50 ± 1.40 cm^3, with a range of 5.80 to 11.39 cm^3. There was no significant correlation between adrenal volume and age. They suggest that sex does not significantly impact adrenal gland volume in this population. This study provides a comprehensive baseline for normal adrenal gland volumes in Chinese adults, which can serve as a reference for future clinical assessments.

3.25Stephanie Nougaret,et al[15] (2010) conducted a study on A pilot study from the Department of Abdominal Imaging in Montpellier, France, measured the volume of the adrenal glands in septic shock recipients and healthy controls. With a semi-automated volume

or, compare the volume of the adrenal glands in patients with septic shock versus control patients. Semi-automated technology was used to measure the volume of the adrenal glands and their intra - observer variation in 104 patients with septic shock and 40 control individuals. In order to better understand how volume affects critical care patient outcomes, the capacities of normal and septic shock patients were examined. In normal people, the mean overall amount of both adrenal glands was 7.2 cm3, while in septic shock sufferers, it was 13.3 cm3. Repeatability of the measurements was quite good With a 0.87 agreement ratio. an increased survival rate in critical care was linked to an increase in adrenal gland size. The current study reveals that it is simple and reliable to assess the volume of the adrenal glands using moderately technology. Sepsis patients' adrenal gland size was discovered to be approximately twice as large as that of control patients. Lack of increased volume during sepsis appears to be associated with a higher death rate and may serve as a prognostic indicator. feature that might help the clinician determine their course of action. [15]

3.26.Mark E. Lockhart et al. (2001) conducted a study on “Imaging of adrenal masses” The paper presents a comprehensive overview of the diagnostic capabilities and challenges associated with imaging adrenal masses, emphasizing the effectiveness of non-invasive techniques while acknowledging the limitations in certain cases. The imaging appearance of adrenal lesions is often specific, allowing for confident diagnosis without further imaging in many cases. Common lesions such as adrenal adenomas, pheochromocytomas, and myelolipomas exhibit distinct characteristics that aid in diagnosis . A significant focus is placed on incidental adrenal masses, termed incidentalomas, which are detected in 0.35-4.4% of CT studies. The paper notes that approximately 78-87% of lesions smaller than 3 cm are benign, while at least 90% of lesions larger than 3 cm are malignant. This highlights the importance of size and imaging characteristics in determining the nature of adrenal lesions. The paper identifies several normal anatomical structures that may mimic adrenal masses on CT scans, such as the gastric fundus, splenic lobulation, and pancreatic masses. The use of oral contrast is emphasized to prevent misinterpretation, and advancements in imaging technology are noted to reduce these diagnostic pitfalls .

3.27. Dieter H. Szolar et al. (1997) conducted a study on “Quantitative CT Evaluation of Adrenal Gland Masses: A Step Forward in the Differentiation between Adenomas and Nonadenomas” The paper titled "CT Evaluation of Adrenal Gland Masses: A Step Forward in the Differentiation between Adenomas and Nonadenomas?" explores the effectiveness of CT imaging in distinguishing between adrenal adenomas and nonadenomas . However, the provided

contexts do not contain specific results or findings from the study. Here are some general insights that can be inferred based on the topic CT Imaging Efficacy: The paper likely discusses the advancements in CT imaging techniques that enhance the differentiation of adrenal masses. This includes the use of specific imaging protocols and contrast agents that improve the visibility of adrenal gland structures. The study may outline specific radiological criteria used to differentiate between adenomas and nonadenomas, such as size, density, and enhancement patterns observed in CT scans. These criteria are crucial for accurate diagnosis and subsequent management. The results might emphasize the clinical significance of accurately distinguishing between adenomas and nonadenomas, as this impacts treatment decisions. For instance, adenomas may require less aggressive management compared to nonadenomas, which could be malignant.

3.28.j. M. Vincent et al. (1994) conducted a study on "The Size of Normal Adrenal Glands on Computed Tomography" The study aimed to determine the size of normal adrenal glands using computed tomography (CT) images from 55 patients. The results highlighted several key findings regarding the measurements and configurations of the adrenal glands Identificatin and measurement Challenges Both adrenal glands were successfully identified in all patients; however, not all measurements could be obtained due to poor definition of gland margins. This was attributed to a lack of retroperitoneal fat and the proximity of adjacent normal structures, which complicated the delineation of the glands. The left adrenal gland was frequently observed to have a triangular configuration, which hindered the ability to obtain limb measurements in some cases.

3.291j. M. Vincent, et al (1994) conducted a study on a CT scan, the size of the normal adrenal glands is shown. Diagnostic Imaging Department and St. Bartholomew's Hospital, London. The size of typical adrenal glands was the focus of our study. In 55 individuals who were already undergoing computed tomography (CT) The CT images were used to assess the adrenal glands for standard clinical procedures. People with diseases that are recognized to alter the size of the adrenal glands were excluded, as were cases where the aldosterone were enlarging focally and suggesting a mass. The includes the full of the medial and lateral limbs, as well as the maximum width parallel to the long axis of the gland body, were evaluated. The maximal width of the right adrenal gland was 0.61 mm the width of the medial limb was 0.28 mm, and the width of the lateral limb was 0.28 mm. T The total width of the left adrenal gland was 0.79 mm, the width of the medial limb was 0.33 mm , and the width of the lateral limb was 0.30 mm. [16]

3.30.jean-Philippe Montagne, Et Al (1978) conducted a study on CT of the Normal Adrenal Gland in Department of Radiology, University of California School of Medicine. In 60 randomized individuals with symptoms of an adrenal ailment, the position, dimensions, and form of the two normal adrenal glands were studied in CT body scans. In 78% of the patients whose cases were examined, both glands were clearly defined. Computed tomography measures of the length, breadth, and thickness of the adrenal glands were similar to those taken through surgery and post mortem. Both of the adrenal glands' presence, position, size, and form were assessed. For each scanner, measurements were taken on the hard copy recording media that is regularly utilised in our sector. To get the true size, the values were multiplied by the appropriate min ification factor and taken down to the nearest millimetre. Corrected measurements to the nearest 0.5 cm were obtained using this technique.[17] 1. Voraparee Suvannarerg et al. (2018) conducted a study on "Normal Adrenal Glands in Multidetector Computed Tomography" to characterize the normal adrenal glands in an adult Thai population using multidetector computed tomography (MDCT). They published their study in Siriraj Medical Journal which is Scopus indexed with an impact factor of 0.50 in 2022-23. They took 75 patients (65 men and 110 women) as a sample size with mean age of 35 years to measure thickness, width, and length. The study found that the most common morphology of both adrenal glands was the inverted Y shape, observed in 85.8% of right glands and 93.7% of left glands. Other shapes, such as inverted V and linear, were less common. Notably, no triangular shapes were identified in normal adrenal glands. The right adrenal gland was more frequently located cephalad to the left gland, occurring in 58.9% of cases. They concluded that 95th percentile of size normal adrenal gland should be used as a cutoff value for the differentiation of normal and thickened limbs and body.

CHAPTER-04

MATERIAL AND METHODS

4.1 Study place-

Department of Radiology, Santosh Hospital Ghaziabad U.P.

4.2 Type of study

Clinical based prospective study.

4.3 Design of study

Prospective and cross sectional study.

4.4 Study Duration

August 2023 to june 2024

4.5 Study Population

Western U.P.

4.6 Participants

The patients who are sent to the radiology department for an Abdominal CT examination are the data's primary source. Both OPD and IPD Patients are included in the study.

4.7 Sample size

100 Patients

4.8 Criteria

Convenient sampling

4.9 Inclusion Criteria

- Patients from IPD and OPD with CT examination of the abdomen.
- Male and Female of both gender above 15 year.

4.10 Exclusion Criteria

- Patients with Malignant and Benign tumors.
- Nodular enlargement
- Both gender below 15 years.
- contraindicated patients for CT.

4.11 Study Population

- In the study, 130 patients were in total out of which 100 were in the inclusion criteria and 30 were in the exclusion Criteria.

4.12 Method of Data Collection

16 slice CT scanner(MDCT) is used for the research.

4.13 Armamentarium :

4.14: METHOD OF DATA COLLECTION

We will use a Siemens workstation to take CT abdomen images of patients referred by various departments in the department of radio diagnosis at Santosh Hospital and Research Centre , Ghaziabad , that all of the inclusion criteria, collect data and reconstruct using various computed tomography reconstruction software. The two dimensional axial and coronal images data using MPR , MIP , Volume rendering will be used to attain measurement which will be documented on the case record sheet. The imaging was carried out utilising a Siemens 16 slice MDCT and in accordance with departmental protocol.

4.15: TECHNIQUES OF EXAMINATION

Firstly take a history from patient and screened the patients before entering in scan room for all the radio-opaque objects in region of interest to prevent from artifact in image. Elucidate the examination to the patient then lie the patient on CT couch in Feet first position and cover the area from Level of nipple to 3cm below the inferior border of the pubic symphysis and plan the patient for exam. Give instruction to patient for no any movement during exam. Enter the patient details in console monitor and select for abdomen helical examination and take a topogram of abdomen and select the from Level of nipple to 3cm below the inferior border of the pubic symphysis and start scan in helical mode there by reconstruction, post processing and reformatting images into multiple planes.

4.16:PERFORMANCES AND SPECIFICATIONS OF THE EXAMINATION

Technical Parameters

While many aspects of a CT scanner's functioning are automated, a few technical aspects remain depend on the operating business. Given that these factors may have a significant impact on how well the CT test predicts outcomes, the following:

1. Factors of exposure(mAs, KVp)
2. Pre & Post Collimator.
3. Demonstration of slice thickness for multi detector scanner
4. Rotation time and couch speed
5. Detector configuration systems
6. Automatic control exposure
7. Radiation measured quantity report
8. Reconstruction technique such as back filtered projection or iterative reconstruction

4.17: EQUIPMENT SPECIFICATIONS

1. Scanning time = 2 second per image direct axial acquisition .
2. Image thickness: 3-5mm
3. Algorithm available: medium smooth
4. Axial mode available on CT scanner
5. .A PACS workstation will be available to the radiologist, and certified medical personnel should be able to see the image remotely. There should be a method for automatically transferring image data.

4.18: CT TECHNIQUES AND PROTOCOL

Table 4.1: CT PROTOCOL ABDOMEN

PROTOCOL	CT ABDOMEN
Patient position	Supine
Patient orientation	Feet first
Topogram	Anteroposterior
Planning	Level of nipple to 3cm below the inferior border of the pubic symphysis
Scan type	Axial , coronal
Scan orientation	Caudo-Cranial
Slice thickness	5mm
Slice gap/ Slice increment	5mm
KVp	120
Mas	200-250
Scan Delay	40-60 Seconds
Recon Algorithm	Coronal and Axial
3D Reconstruction	MIP, MPR

4.19:STATISTICAL ANALYSIS

All of the data are gathered and compiled in a Microsoft Excel work sheet, and the results are then analysed using the SPSS 26.0 edition

CHAPTER 5

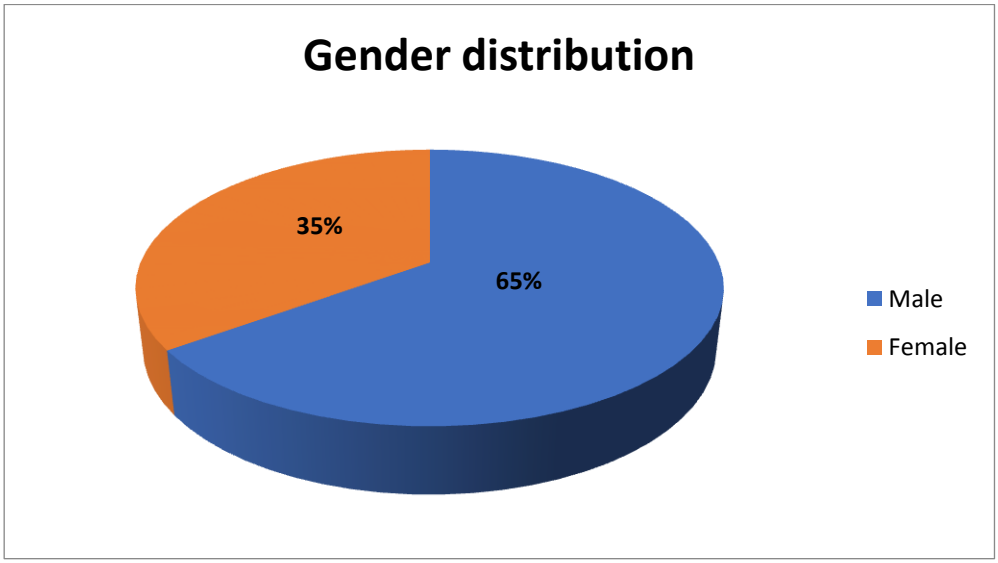
RESULT

Observation

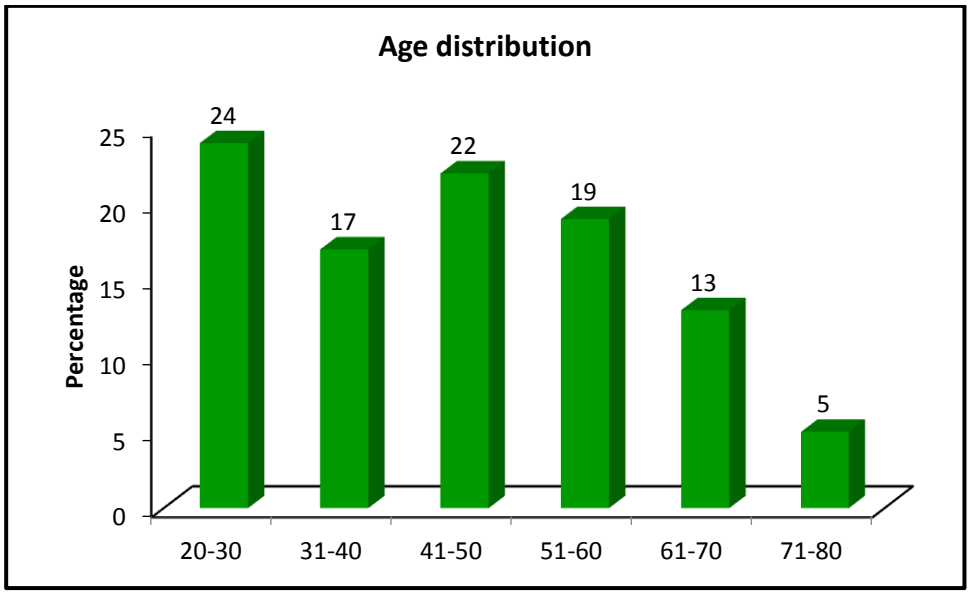
There under supervision of the College of Paramedical Sciences, Teerthanker Mahaveer University, and Moradabad, a total of 100 patients who were referred to the radiology department at Teerthanker Mahaveer Hospital underwent this cross-sectional prospective study.

Table 5.1 : Represents frequency of sample size according to age and gender.

(n = 100)		Frequency
Age groups	20-30	24
	31-40	17
	41-50	22
	51-60	19
	61-70	13
	71-80	5
Gender	Male	65
	Female	35



Graph 5.1 : Gender distribution out of the total number of patients 35 are female and 65 males.



Graph 5.2 : Age distribution

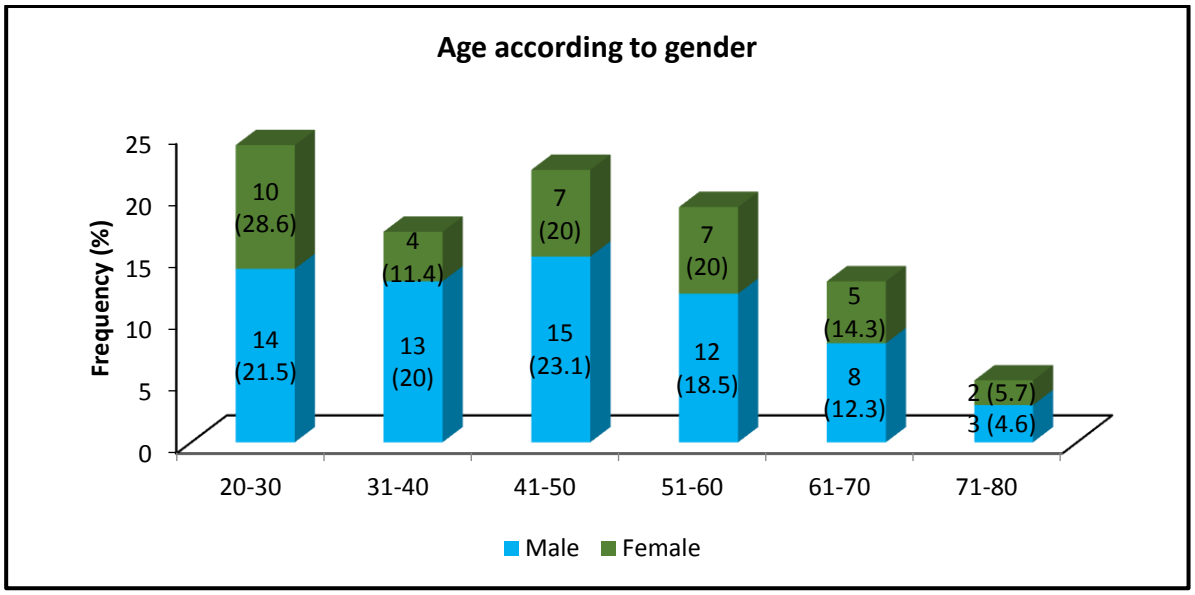
The graph represents distribution of age in different groups.

Table5.2:

Age	%
20-30	24
31-40	17
41-50	22
51-60	19
61-70	13
71-80	5

Table 5.3 : Represents frequency of all the age groups gender wise.

		Gender			
		Male		Female	
		N	%	n	%
Age groups	20-30	14	21.5	10	28.6
	31-40	13	20.0	4	11.4
	41-50	15	23.1	7	20.0
	51-60	12	18.5	7	20.0
	61-70	8	12.3	5	14.3
	71-80	3	4.6	2	5.7



Graph 5.3 : Age according to gender.

The graph represents that the maximum number of patients belonged to the age group of 20-30 and minimum belonged to the age group of 71-80.

Table 5.4 : Mean and SD of all the parameters considered in the study.

(n = 100)	Mean	S.D.
Age	45.6	15.2
Height	5.4	0.3

Weight	**70.6**	**4.4**
BMI (Kg/M2)	**24.0**	**2.3**
RAG Max thickness	**5.4**	**1.3**
RAG Max lateral limbs	**2.8**	**0.7**
RAG Max medial limbs	**2.9**	**0.8**
RAG (Total)	**11.1**	**2.1**
LAG Max thickness	**5.5**	**1.4**
LAG Max lateral limbs	**3.5**	**0.8**
LAG Max medial limbs	**3.1**	**0.9**
LAG (Total)	**12.0**	**2.6**
RAG Coronal length	**1.8**	**0.4**
LAG Coronal length	**1.8**	**0.8**

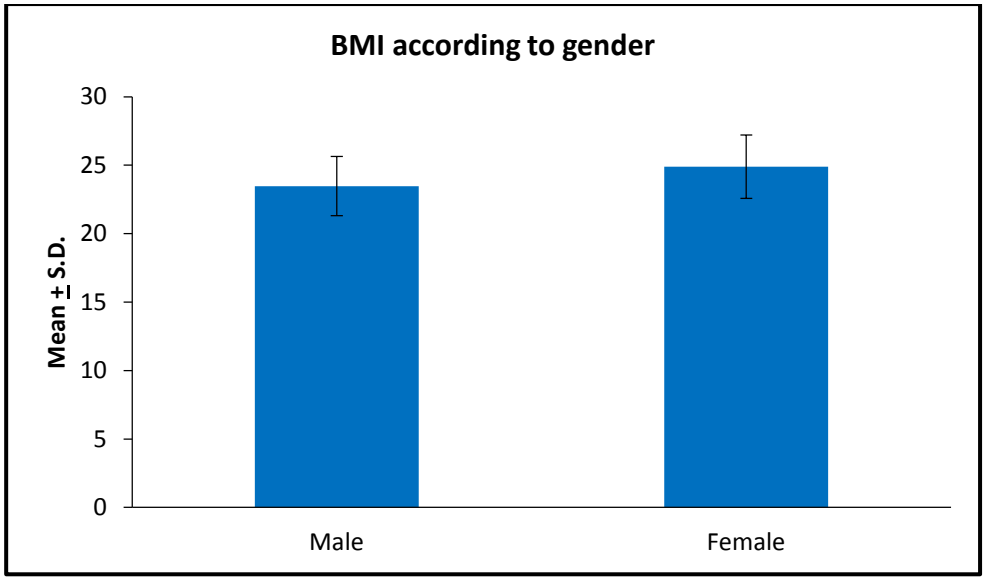
Table 5.5 : Comparison of BMI according to gender

		Mean	**S.D.**	**"t"**	**p value**
BMI (Kg/M2)	**Male**	**23.5**	**2.2**	**-3.055**	**0.003***
	Female	**24.9**	**2.3**		

The table represents mean and SD of the BMI among males and females.

(* Significant)

- The Independent sample "t" test was used to compare the BMI according to gender. There was a difference ($p < 0.05$) in BMI between males and females. females have higher BMI values as compare to males



Graph 5.4: BMI according to gender

The graph shows that the BMI of females is comparatively more than that of the males although with a slight differernce.

Table 5.6 : Comparison of normal thickness of the right adrenal gland according to gender

RAG		Mean	S.D.	"t"	p value
Max thickness	Male	5.3	1.3	-1.169	0.245
	Female	5.6	1.2		
Max lateral limbs	Male	2.9	0.7	0.256	0.798
	Female	2.8	0.8		
Max medial limbs	Male	2.9	0.8	0.501	0.617
	Female	2.8	0.7		
Total	Male	11.0	2.0	-0.429	0.669
	Female	11.2	2.2		
Coronal length	Male	1.8	0.4	-0.492	0.624
	Female	1.8	0.4		

Represents the parameters of the RAG and its SD & Mean values.

The Independent sample “t” test was used to compare the normal thickness of the right adrenal gland according to gender. There was no difference ($p > 0.05$) in normal thickness of the right adrenal gland between males and females.

Table 5.7 : Comparison of normal thickness of the left adrenal gland according to gender

LAG		Mean	S.D.	"t"	p value
Max thickness	Male	5.4	1.3	-0.262	0.794
	Female	5.5	1.5		
Max lateral limbs	Male	3.5	0.8	-0.443	0.659
	Female	3.5	0.9		
Max medial limbs	Male	3.1	0.8	-0.552	0.583
	Female	3.2	1.0		
Total	Male	12.0	2.3	-0.460	0.646
	Female	12.2	3.1		
Coronal length	Male	1.7	0.3	-2.774	0.007*
	Female	2.1	1.3		

(* Significant)

The table represents LAG and its parameters with their respective SD &Mean values.

The Independent sample "t" test was used to compare the normal thickness of the left adrenal gland according to gender. There was a difference ($p < 0.05$) in coronal length of the left adrenal gland between males and females.

- **The coronal length of LAG is higher in females as compare to males .**

Graph 5.14 : LAG Coronal length according to gender

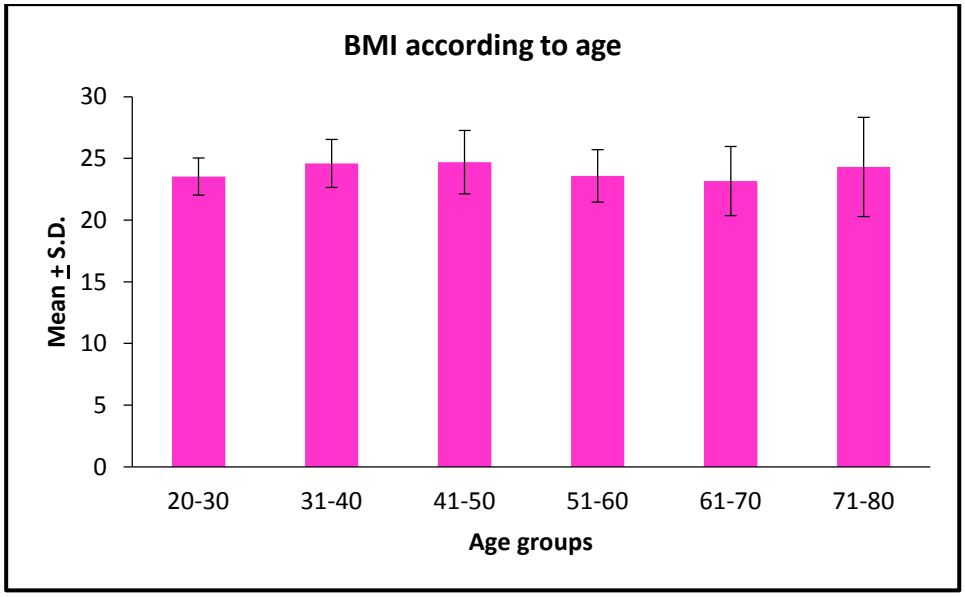
LAG Coronal length is observed to be more in females as compared to males.

Table 5.8 : Comparison of BMI according to age

		Mean	S.D	"F"	p value
BMI (Kg/M2)	20-30	23.5	1.5	1.314	0.265
	31-40	24.6	2.0		
	41-50	24.7	2.6		
	51-60	23.6	2.1		
	61-70	23.2	2.8		
	71-80	24.3	4.0		

A comparative table of BMI with max Mean &SD observed in age group of 41-50.

The one way ANOVA test was used to compare the BMI according to age groups. There was no difference ($p > 0.05$) in BMI according to age groups.



Graph 5.5: BMI according to age

Table 5.9 : Comparison of normal thickness of the right adrenal gland according to age

RAG		Mean	S.D	"F"	p value
Max `thickness	20-30	5.3	1.2	1.990	0.087
	31-40	4.8	1.1		
	41-50	5.8	1.1		
	51-60	5.2	1.6		
	61-70	5.8	1.2		
	71-80	6.0	1.4		
Max lateral limbs	20-30	2.7	0.7	0.529	0.754
	31-40	2.7	0.5		
	41-50	2.9	0.8		
	51-60	2.8	0.7		
	61-70	3.1	1.0		
	71-80	2.8	0.4		
Max medial limbs	20-30	2.6	0.8	1.071	0.382
	31-40	2.8	0.9		
	41-50	3.1	0.7		
	51-60	3.0	0.8		
	61-70	2.7	0.7		
	71-80	3.1	0.5		
Total	20-30	10.7	1.8	1.591	0.170
	31-40	10.3	2.0		
	41-50	11.9	2.0		
	51-60	10.9	1.9		
	61-70	11.5	2.6		
	71-80	11.9	2.1		
Coronal length	20-30	1.7	0.4	0.697	0.627
	31-40	1.8	0.3		
	41-50	1.8	0.3		
	51-60	1.9	0.5		
	61-70	1.9	0.3		
	71-80	1.7	0.4		

Normal thickness of RAG is observed to be maximum for the thickness parameter.

The one way ANOVA test was used to compare the normal thickness of the right adrenal gland according to age groups. There was no difference ($p > 0.05$) in normal thickness of the right adrenal gland according to age groups.

Table 5.10: Comparison of normal thickness of the left adrenal gland according to age

LAG		Mean	S.D	"F"	p value
Iax thickness	20-30	5.2	1.0	0.502	0.774
	31-40	5.4	1.5		
	41-50	5.4	1.4		
	51-60	5.4	1.7		
	61-70	5.9	1.5		
	71-80	5.9	1.3		
Max lateral limbs	20-30	3.4	0.8	0.545	0.742
	31-40	3.7	0.8		
	41-50	3.6	1.1		
	51-60	3.3	0.7		
	61-70	3.4	0.7		
	71-80	3.2	0.7		
Max medial limbs	20-30	3.0	0.8	0.462	0.803
	31-40	3.1	0.9		
	41-50	3.1	1.1		
	51-60	3.2	0.9		
	61-70	3.3	1.0		
	71-80	2.7	0.5		
Total	20-30	11.7	2.0	0.261	0.933
	31-40	12.2	2.7		
	41-50	12.1	3.2		
	51-60	11.9	2.9		
	61-70	12.7	2.5		
	71-80	11.8	2.1		
Coronal	20-30	1.8	0.4	1.061	0.387

length	**31-40**	**2.2**	**1.8**		
	41-50	**1.6**	**0.3**		
	51-60	**1.7**	**0.4**		
	61-70	**2.0**	**0.5**		
	71-80	**1.8**	**0.3**		

Normal thickness of LAG is observed max in the coronal length parameter.

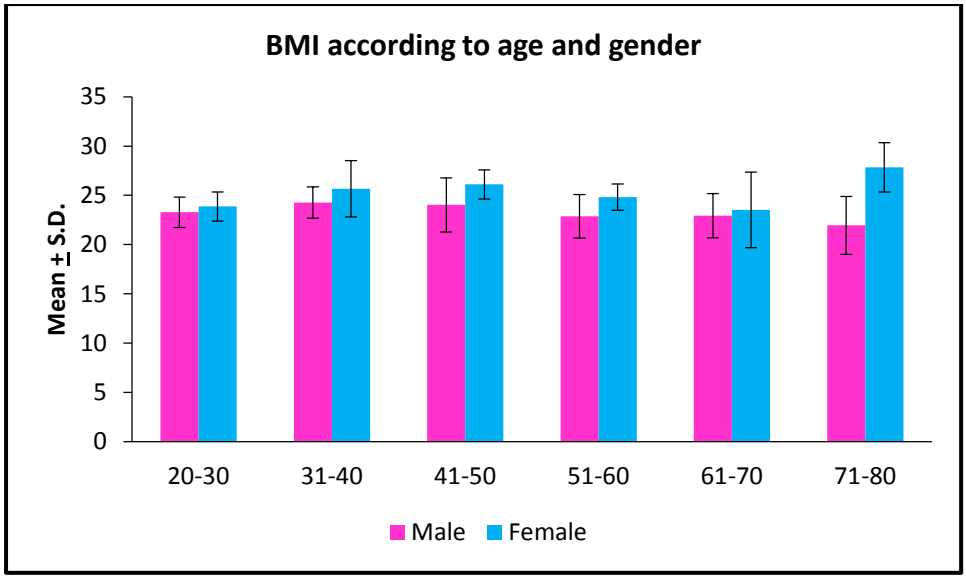
The one way ANOVA test was used to compare the normal thickness of the left adrenal gland according to age groups. There was no difference ($p > 0.05$) in normal thickness of the left adrenal gland according to age groups.

Table 5.11: BMI according to age for each gender

		Male				**Female**			
		Mean	**S.D**	**"F"**	**p value**	**Mean**	**S.D**	**"F"**	**p value**
BMI (Kg/M2)	**20-30**	**23.3**	**1.6**	**1.159**	**0.340**	**23.9**	**1.5**	**2.181**	**0.084**
	31-40	**24.3**	**1.6**			**25.7**	**2.9**		
	41-50	**24.0**	**2.7**			**26.1**	**1.5**		
	51-60	**22.9**	**2.2**			**24.8**	**1.3**		
	61-70	**22.9**	**2.2**			**23.5**	**3.8**		
	71-80	**22.0**	**2.9**			**27.8**	**2.5**		

Table shows the mean and & SD values age wise.

The one way ANOVA test was used to compare the BMI according to age for each gender. There was no difference ($p > 0.05$) in the BMI according to age group for both males and females



Graph 5.6: BMI according to age and gender

Combined graph of male and female in different age groups.

Table 5.12: Normal thickness of the right adrenal gland according to age for each gender

RAG		Male				Female			
		Mean	S.D	"F"	p value	Mean	S.D	"F"	p value
Max thickness	20-30	5.3	1.2	1.384	0.244	5.3	1.1	0.640	0.671
	31-40	4.6	1.2			5.2	0.8		
	41-50	5.7	1.2			6.1	0.8		
	51-60	5.0	1.6			5.4	1.7		
	61-70	5.6	0.9			6.1	1.6		
	71-80	6.1	1.6			5.8	1.5		
Max lateral limbs	20-30	2.7	0.7	0.360	0.874	2.7	0.7	0.500	0.774
	31-40	2.7	0.6			2.7	0.5		
	41-50	3.0	0.8			2.7	0.8		
	51-60	2.9	0.8			2.7	0.4		
	61-70	2.9	0.5			3.3	1.5		
	71-80	2.7	0.4			3.0	0.4		
Max medial limbs	20-30	2.6	0.8	0.487	0.784	2.6	0.8	0.736	0.602
	31-40	2.9	1.0			2.6	0.5		
	41-50	3.1	0.8			3.2	0.7		

	51-60	**3.0**	**0.9**			**2.9**	**0.7**		
	61-70	**2.8**	**0.7**			**2.5**	**0.8**		
	71-80	**3.2**	**0.5**			**3.0**	**0.6**		
Total	**20-30**	**10.7**	**1.9**	**1.078**	**0.382**	**10.6**	**1.8**	**0.488**	**0.782**
	31-40	**10.2**	**2.3**			**10.5**	**0.9**		
	41-50	**11.8**	**2.2**			**12.0**	**1.8**		
	51-60	**10.9**	**1.5**			**11.0**	**2.6**		
	61-70	**11.2**	**1.8**			**11.9**	**3.6**		
	71-80	**12.0**	**2.3**			**11.7**	**2.5**		
oronal length	**20-30**	**1.7**	**0.3**	**1.295**	**0.279**	**1.8**	**0.5**	**0.241**	**0.941**
	31-40	**1.8**	**0.3**			**1.9**	**0.2**		
	41-50	**1.7**	**0.3**			**1.9**	**0.3**		
	51-60	**2.0**	**0.5**			**1.8**	**0.4**		
	61-70	**1.9**	**0.3**			**1.9**	**0.3**		
	71-80	**1.6**	**0.2**			**2.0**	**0.5**		

RAG values are observed to be maximum for the max thickness parameter.

The one way ANOVA test was used to compare the normal thickness of the right adrenal gland according to age for each gender. There was no difference ($p > 0.05$) in the normal thickness of the right adrenal gland according to age group for both males and females.

Combined comparison of gender according to age for the RAF coronal parameter.

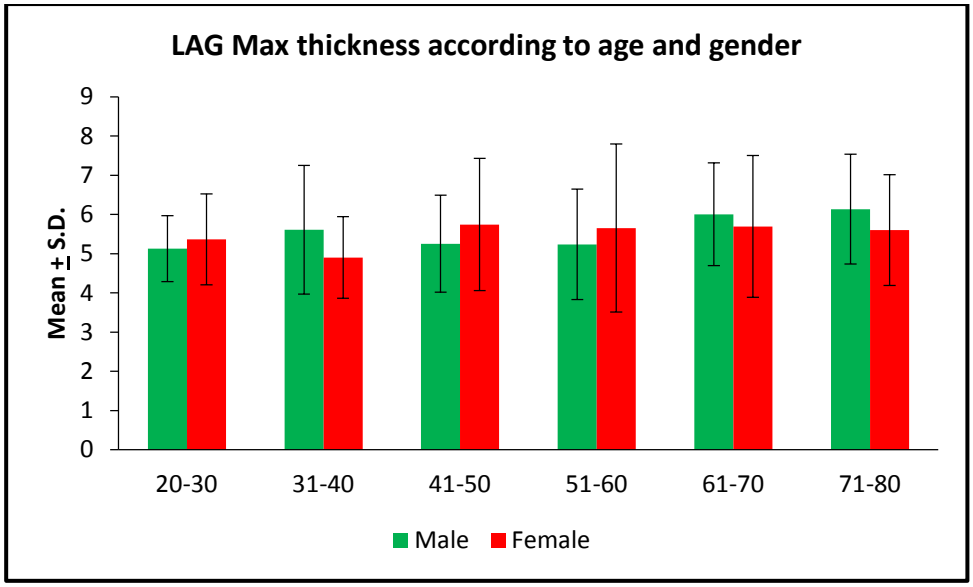
Table 5.13: Normal thickness of the left adrenal gland according to age for each gender

LAG		**Male**				**Female**			
		Mean	**S.D**	**"F"**	**value**	**Mean**	**S.D**	**"F"**	**p value**
Max thickness	**20-30**	**5.1**	**0.8**	**0.783**	**0.566**	**5.4**	**1.2**	**0.185**	**0.966**
	31-40	**5.6**	**1.6**			**4.9**	**1.0**		
	41-50	**5.3**	**1.2**			**5.7**	**1.7**		
	51-60	**5.2**	**1.4**			**5.7**	**2.1**		
	61-70	**6.0**	**1.3**			**5.7**	**1.8**		
	71-80	**6.1**	**1.4**			**5.6**	**1.4**		
Max lateral	**20-30**	**3.4**	**0.9**	**0.566**	**0.725**	**3.5**	**0.8**	**0.632**	**0.677**

limbs	**31-40**	**3.6**	**0.9**			**3.8**	**0.4**		
	41-50	**3.5**	**0.9**			**3.9**	**1.4**		
	51-60	**3.2**	**0.6**			**3.6**	**0.9**		
	61-70	**3.6**	**0.5**			**3.1**	**1.0**		
	71-80	**3.5**	**0.8**			**2.9**	**0.3**		
Max medial limbs	**20-30**	**3.1**	**0.8**	**0.036**	**0.999**	**3.0**	**0.7**	**0.723**	**0.612**
	31-40	**3.1**	**1.0**			**3.0**	**0.6**		
	41-50	**3.1**	**1.0**			**3.0**	**1.3**		
	51-60	**3.0**	**0.7**			**3.5**	**1.2**		
	61-70	**3.1**	**0.6**			**3.8**	**1.5**		
	71-80	**2.9**	**0.6**			**2.4**	**0.2**		
Total	**20-30**	**11.5**	**1.8**	**0.469**	**0.798**	**11.9**	**2.3**	**0.187**	**0.965**
	31-40	**12.4**	**3.1**			**11.7**	**1.1**		
	41-50	**11.8**	**2.6**			**12.7**	**4.3**		
	51-60	**11.5**	**2.1**			**12.7**	**3.9**		
	61-70	**12.7**	**1.9**			**12.6**	**3.5**		
	71-80	**12.5**	**2.5**			**10.9**	**1.5**		
Coronal length	**20-30**	**1.7**	**0.4**	**1.155**	**0.342**	**1.9**	**0.4**	**1.764**	**0.152**
	31-40	**1.7**	**0.3**			**3.8**	**3.6**		
	41-50	**1.5**	**0.3**			**1.7**	**0.2**		
	51-60	**1.6**	**0.4**			**1.9**	**0.3**		
	61-70	**1.8**	**0.2**			**2.3**	**0.7**		
	71-80	**1.5**	**0.1**			**2.1**	**0.2**		

Thickness of LAG is observed to be maximum for coronal length parameter.

The one way ANOVA test was used to compare the normal thickness of the left adrenal gland according to age for each gender. There was no difference ($p > 0.05$) in the normal thickness of the left adrenal gland according to age group for both males and females.



Graph 5.7: LAG Max thickness according to age and gender

Table 5.14: BMI according to gender for each age group

BMI		Mean	S.D.	"t"	p value
20-30	Male	23.3	1.6	-0.936	0.360
	Female	23.9	1.5		
31-40	Male	24.3	1.6	-1.288	0.217
	Female	25.7	2.9		
41-50	Male	24.0	2.7	-1.860	0.078
	Female	26.1	1.5		
51-60	Male	22.9	2.2	-2.123	0.049*
	Female	24.8	1.3		
61-70	Male	22.9	2.2	-0.351	0.732
	Female	23.5	3.8		
71-80	Male	22.0	2.9	-2.295	0.105
	Female	27.8	2.5		

(* Significant)

Distribution of BMI according to age and gender in each age group with their SD &Mean values.

The Independent sample "t" test was used to compare the BMI according to gender for each age group. There was a difference ($p < 0.05$) in the BMI between males and females for the age group 51 to 60 years.

- **In age group of 51 to 60 the females have higher BMI value as compare to males**

Table 5.15: Max thickness (within right and left) according to gender for each age group

Max thickness		RAG				LAG			
		Mean	S.D.	"t"	p value	Mean	S.D.	"t"	p value
20-30	Male	5.3	1.2	0.074	0.942	5.1	0.8	-0.584	0.565
	Female	5.3	1.1			5.4	1.2		
31-40	Male	4.6	1.2	-0.844	0.412	5.6	1.6	0.805	0.434
	Female	5.2	0.8			4.9	1.0		
41-50	Male	5.7	1.2	-0.784	0.443	5.3	1.2	-0.759	0.457
	Female	6.1	0.8			5.7	1.7		
51-60	Male	5.0	1.6	-0.419	0.681	5.2	1.4	-0.514	0.614
	Female	5.4	1.7			5.7	2.1		
61-70	Male	5.6	0.9	-0.776	0.454	6.0	1.3	0.361	0.725
	Female	6.1	1.6			5.7	1.8		
71-80	Male	6.1	1.6	0.268	0.806	6.1	1.4	0.416	0.706
	Female	5.8	1.5			5.6	1.4		

Max thickness distributed between male and female according to various age groups for RAG and LAG

The Independent sample "t" test was used to compare the max thickness (within right and left) according to gender for each age group. There was no difference ($p > 0.05$) in the max thickness (within right and left) between males and females for the entire age groups.

Table 5.16: Max lateral limbs (within right and left) according to gender for each age group

Max lateral limbs		RAG				LAG			
		Mean	S.D.	"t"	P value	Mean	S.D.	"t"	p value
20-30	Male	2.7	0.7	0.115	0.909	3.6	0.9	-0.228	0.823
	Female	2.7	0.7			3.8	0.4		
31-40	Male	2.7	0.6	0.016	0.987	3.4	0.9	-0.333	0.742
	Female	2.7	0.5			3.5	0.8		
41-50	Male	3.0	0.8	0.763	0.455	3.5	0.9	-0.787	0.441
	Female	2.7	0.8			3.9	1.4		
51-60	Male	2.6	0.8	-0.005	0.996	3.2	0.6	-1.284	0.217
	Female	2.6	0.8			3.6	0.9		
61-70	Male	2.9	0.8	0.687	0.502	3.6	0.5	1.262	0.233
	Female	2.7	0.4			3.1	1.0		
71-80	Male	2.9	0.5	-0.741	0.474	3.5	0.8	0.888	0.440
	Female	3.3	1.5			2.9	0.3		

Max lateral limbs distributed between male and female according to various age groups for RAG and LAG

The Independent sample “t” test was used to compare the max lateral limbs (within right and left) according to gender for each age group. There was no difference ($p > 0.05$) in the max lateral limbs (within right and left) between males and females for the entire age groups.

Table 5.17: Max medial limbs (within right and left) according to gender for each age group

Max medial limbs		RAG				LAG			
		Mean	S.D.	"t"	p value	Mean	S.D.	"t"	value
20-30	Male	2.7	0.4	-0.612	0.584	3.1	0.8	0.144	0.887
	Female	3.0	0.4			3.0	0.7		
31-40	Male	2.9	1.0	0.495	0.628	3.1	1.0	0.226	0.824

	Female	**2.6**	**0.5**			**3.0**	**0.6**		
41-50	**Male**	**3.1**	**0.8**	**-0.256**	**0.800**	**3.1**	**1.0**	**0.084**	**0.934**
	Female	**3.2**	**0.7**			**3.0**	**1.3**		
51-60	**Male**	**3.0**	**0.9**	**0.098**	**0.923**	**3.0**	**0.7**	**-0.954**	**0.353**
	Female	**2.9**	**0.7**			**3.5**	**1.2**		
61-70	**Male**	**2.8**	**0.7**	**0.586**	**0.569**	**3.1**	**0.6**	**-1.190**	**0.259**
	Female	**2.5**	**0.8**			**3.8**	**1.5**		
71-80	**Male**	**3.2**	**0.5**	**0.426**	**0.699**	**2.9**	**0.6**	**1.280**	**0.291**
	Female	**3.0**	**0.6**			**2.4**	**0.2**		

Max medial limbs distributed between male and female according to various age groups for RAG and LAG

The Independent sample "t" test was used to compare the max medial limbs (within right and left) according to gender for each age group. There was no difference ($p > 0.05$) in the max medial limbs (within right and left) between males and females for the entire age groups.

Table 5.18: Normal thickness (within right and left) according to gender for each age group

Total		**RAG**				**LAG**			
		Mean	**S.D.**	**"t"**	**p value**	**Mean**	**S.D.**	**"t"**	**p value**
20-30	**Male**	**10.7**	**1.9**	**0.087**	**0.931**	**11.5**	**1.8**	**-0.367**	**0.717**
	Female	**10.6**	**1.8**			**11.9**	**2.3**		
31-40	**Male**	**10.2**	**2.3**	**-0.239**	**0.815**	**12.4**	**3.1**	**0.450**	**0.659**
	Female	**10.5**	**0.9**			**11.7**	**1.1**		
41-50	**Male**	**11.8**	**2.2**	**-0.217**	**0.831**	**11.8**	**2.6**	**-0.548**	**0.590**
	Female	**12.0**	**1.8**			**12.7**	**4.3**		
51-60	**Male**	**10.9**	**1.5**	**-0.054**	**0.957**	**11.5**	**2.1**	**-0.916**	**0.373**
	Female	**11.0**	**2.6**			**12.7**	**3.9**		
61-70	**Male**	**11.2**	**1.8**	**-0.452**	**0.660**	**12.7**	**1.9**	**0.112**	**0.913**
	Female	**11.9**	**3.6**			**12.6**	**3.5**		
71-80	**Male**	**12.0**	**2.3**	**0.178**	**0.870**	**12.5**	**2.5**	**0.807**	**0.479**
	Female	**11.7**	**2.5**			**10.9**	**1.5**		

Total thickness distributed between male and female according to various age groups for RAG and LAG .

The Independent sample "t" test was used to compare the normal thickness (within right and left) according to gender for each age group. There was no difference ($p > 0.05$) in the normal thickness (within right and left) between males and females for the entire age groups.

Table 5.19: Coronal length (within right and left) according to gender for each age group

Coronal length		RAG				LAG			
		Mean	S.D.	"t"	p value	Mean	S.D.	"t"	p value
20-30	Male	1.7	0.3	-0.402	0.692	1.7	0.4	-0.787	0.439
	Female	1.8	0.5			1.9	0.4		
31-40	Male	1.8	0.3	-0.221	0.828	1.7	0.3	-2.267	0.039*
	Female	1.9	0.2			3.8	3.6		
41-50	Male	1.7	0.3	-1.013	0.324	1.5	0.3	-1.657	0.114
	Female	1.9	0.3			1.7	0.2		
51-60	Male	2.0	0.5	0.958	0.351	1.6	0.4	-1.354	0.193
	Female	1.8	0.4			1.9	0.3		
61-70	Male	1.9	0.3	-0.385	0.708	1.8	0.2	-1.643	0.129
	Female	1.9	0.3			2.3	0.7		
71-80	Male	1.6	0.2	-1.503	0.230	1.5	0.1	-4.266	0.024*
	Female	2.0	0.5			2.1	0.2		

(* Significant)

Coronal thickness distributed between male and female according to various age groups for RAG and LAG

The Independent sample "t" test was used to compare the coronal length (within right and left) according to gender for each age group. There was a difference ($p < 0.05$) in the coronal length (within left) between males and females for the age groups: 31-40 and 71-80 years.

- **Coronal length of left side of LAG Have shows a greater difference in coronal length of left side LAG of (31-40) , (71-80) year.**
- **In (31-40) female have greater & similarly in (71-80) female have greater**
- **The coronal length of LAG is highest in females of 31-40**

Table 5.20: Normal thickness of the adrenal gland between right and left sides

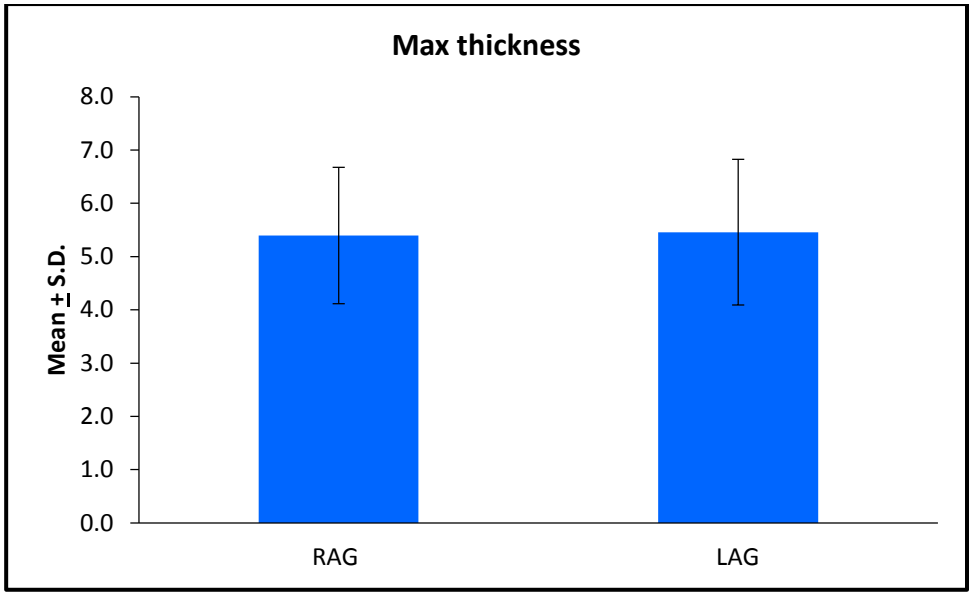
(n = 100)		Mean	S.D.	"t"	p value
Max thickness	RAG	5.4	1.3	-0.337	0.737
	LAG	5.5	1.4		
Max lateral limbs	RAG	2.8	0.7	-6.771	< 0.001*
	LAG	3.5	0.8		
Max medial limbs	RAG	2.9	0.8	-2.173	0.032*
	LAG	3.1	0.9		
Total	RAG	11.1	2.1	-3.188	0.002*
	LAG	12.0	2.6		
Coronal length	RAG	1.8	0.4	-0.011	0.991
	LAG	1.8	0.8		

(* Significant)

Parameters of adrenal gland between right and left.

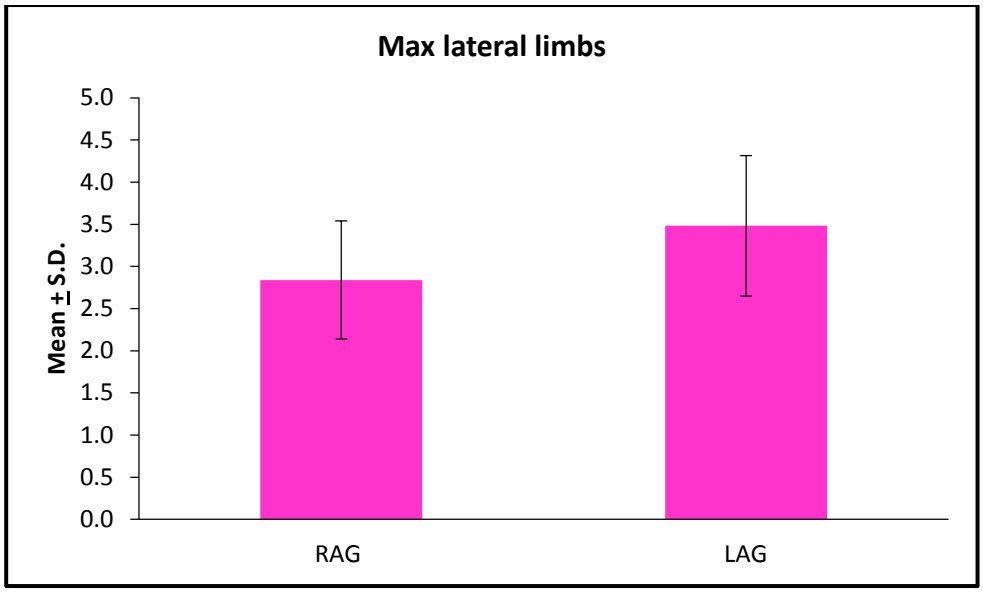
The Paired "t" test was used to compare normal thickness of the adrenal gland between right and left sides. There was a difference ($p < 0.05$) in max lateral limbs, max medial limbs, and total gland between right and left sides.

- **In comparison of RAG & the LAG has greater** measurements of max lateral limbs , max medial limb and total measurement



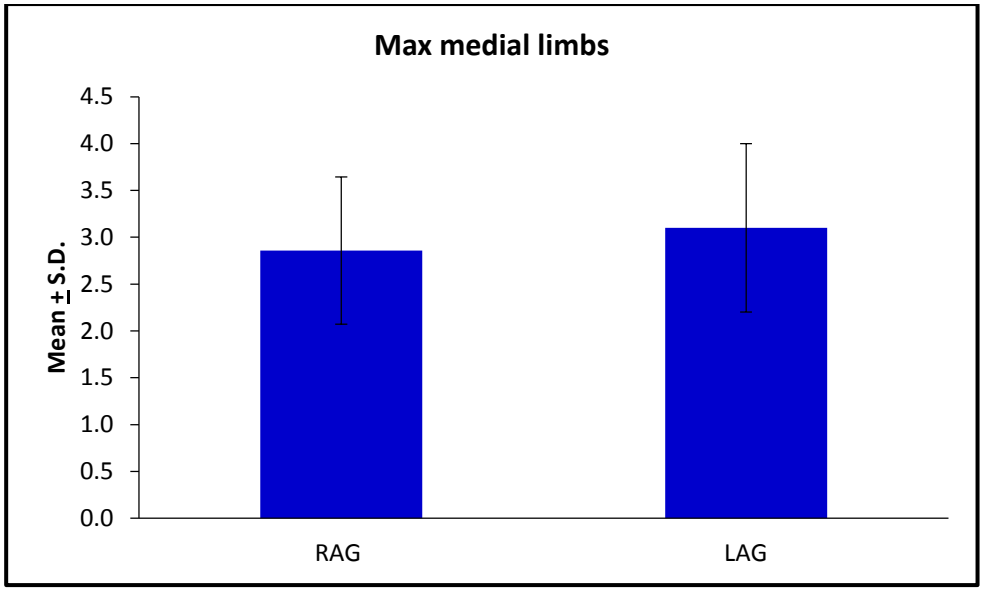
Graph 5.8: Max thickness

Max thickness comparison between RAG and LAG.



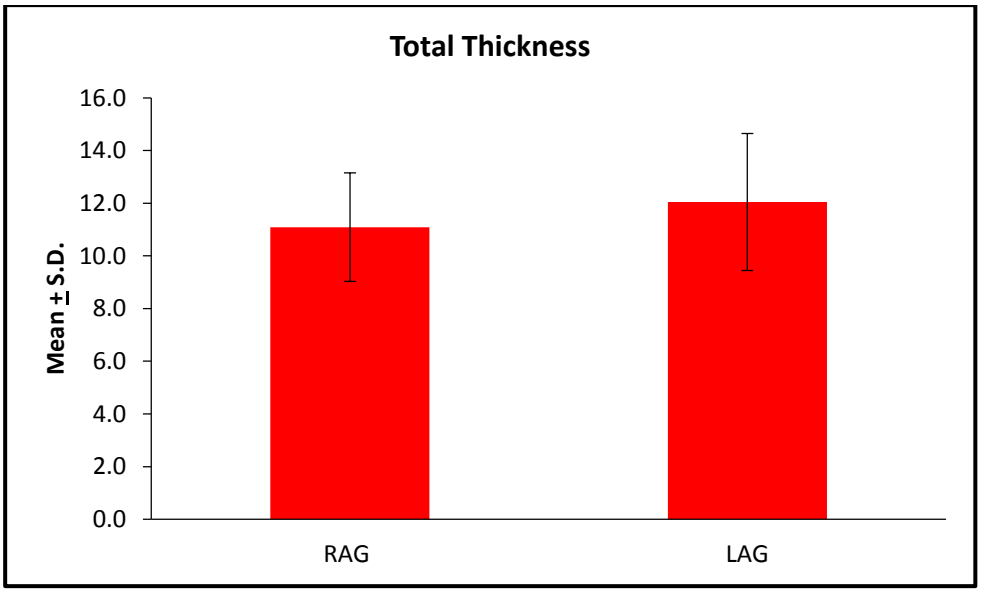
Graph 5.9: Max lateral limbs

Max lateral limb comparison between RAG and LAG



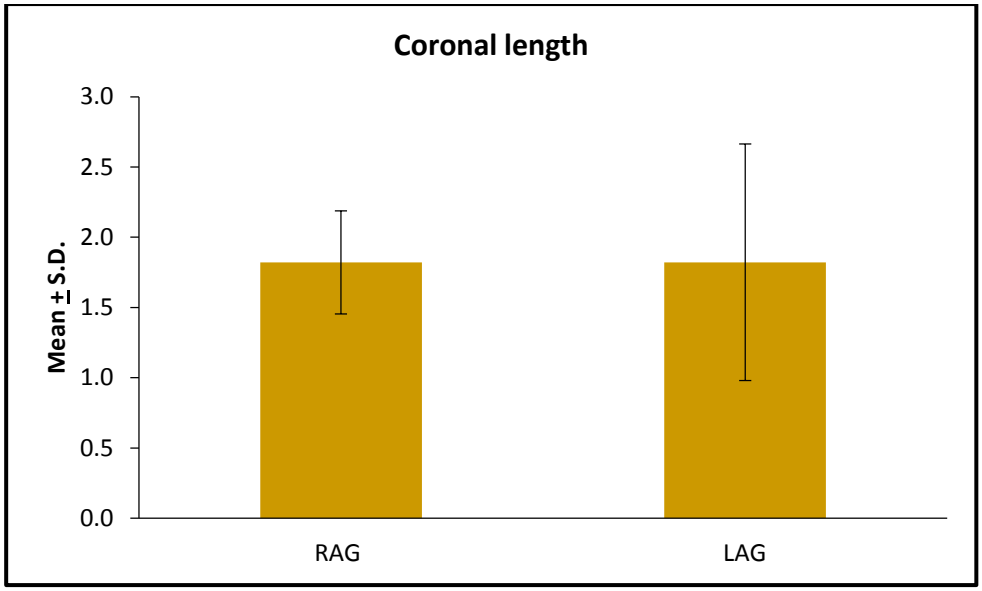
Graph 5.10: Max medial limbs

Max medial limb comparison between RAG and LAG.



Graph 5.11: Total thickness

Total thickness comparison between RAG and LAG.



Graph 5.12: Coronal length

Coronal length comparison between RAG and LAG.

Table 5.21: Normal thickness of the adrenal gland between right and left sides according to gender

		Male				Female			
		Mean	S.D.	"t"	p value	Mean	S.D.	"t"	p value
Max thickness	RAG	5.3	1.3	-0.643	0.522	5.6	1.2	0.300	0.766
	LAG	5.4	1.3			5.5	1.5		
Max lateral Limbs	RAG	2.9	0.7	-5.816	< 0.001*	2.8	0.8	-3.735	0.001*
	LAG	3.5	0.8			3.5	0.9		
Max medial limbs	RAG	2.9	0.8	-1.275	0.207	2.8	0.7	-1.913	0.064
	LAG	3.1	0.8			3.2	1.0		
Total	RAG	11.0	2.0	-2.690	0.009*	11.2	2.2	-1.750	0.089
	LAG	12.0	2.3			12.2	3.1		
Coronal length	RAG	1.8	0.4	3.215	0.002*	1.8	0.4	-1.244	0.222
	LAG	1.7	0.3			2.1	1.3		

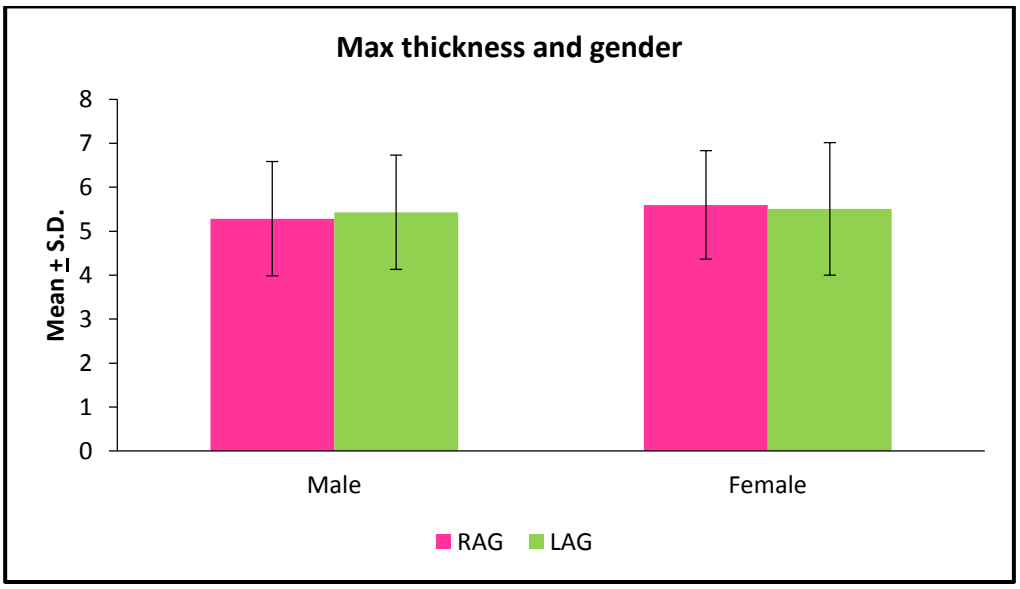
(* Significant)

Normal thickness of adrenal gland compared for male and females.

The Paired "t" test was used to compare normal thickness of the adrenal gland between right and left sides according to gender. There was a difference ($p < 0.05$) in max lateral limbs between

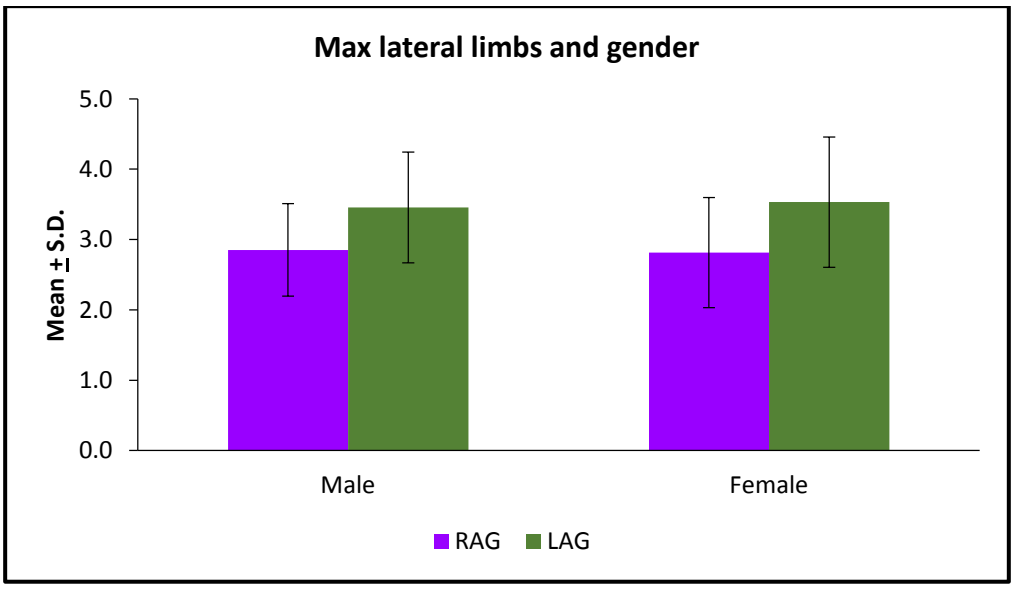
right and left sides for both the gender. Also, among males a difference ($p < 0.05$) in normal thickness (Total) as well as coronal length was found between right and left sides.

- **In male Max lateral limb is greater of LAG that's why total area of LAG is greater. In male RAG total length is greater.**



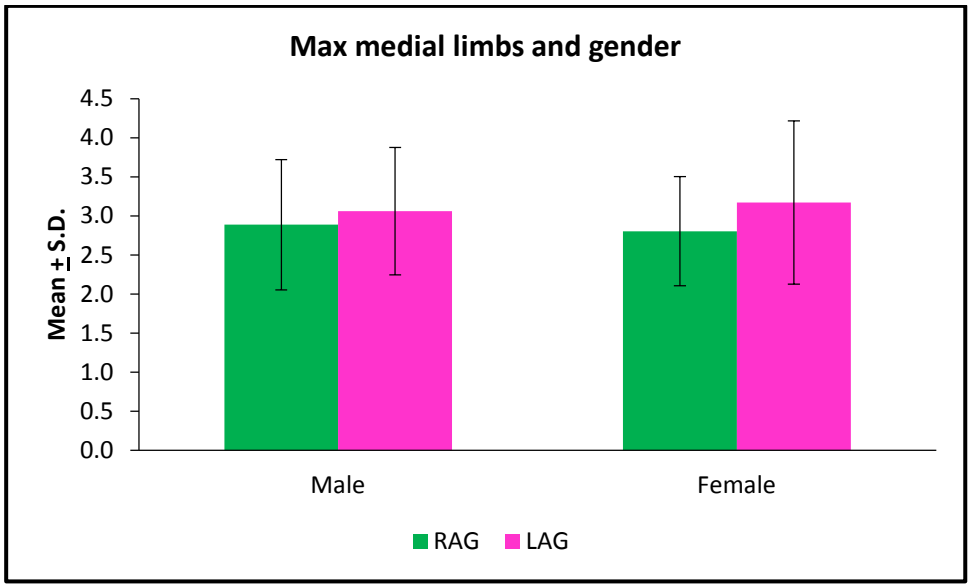
Graph 5.13: Max thickness and gender

Combined comparison of male and female for maximum thickness between RAG and LAG.



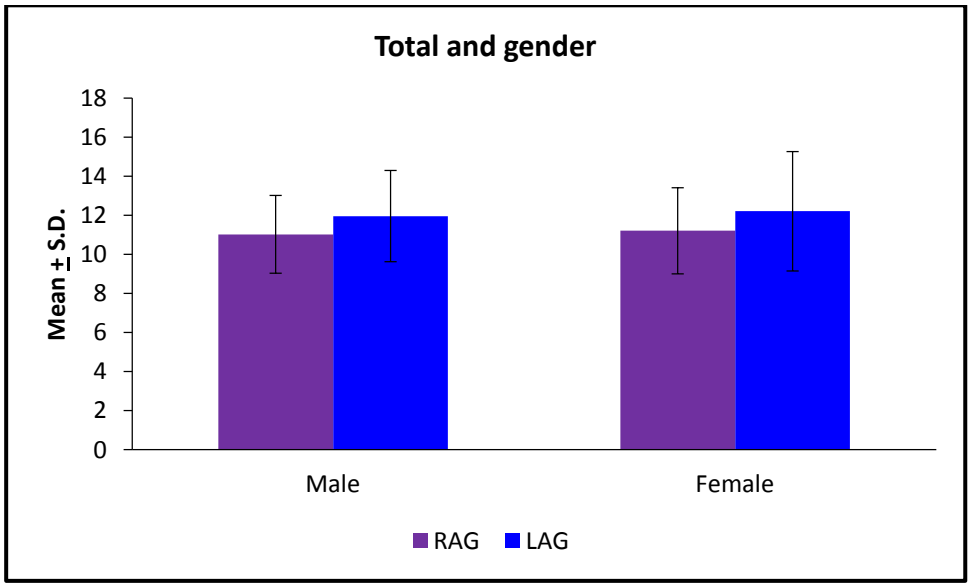
Graph 5.14: Max lateral limbs and gender

Combined comparison of male and female for maximum lateral limb between RAG and LAG.



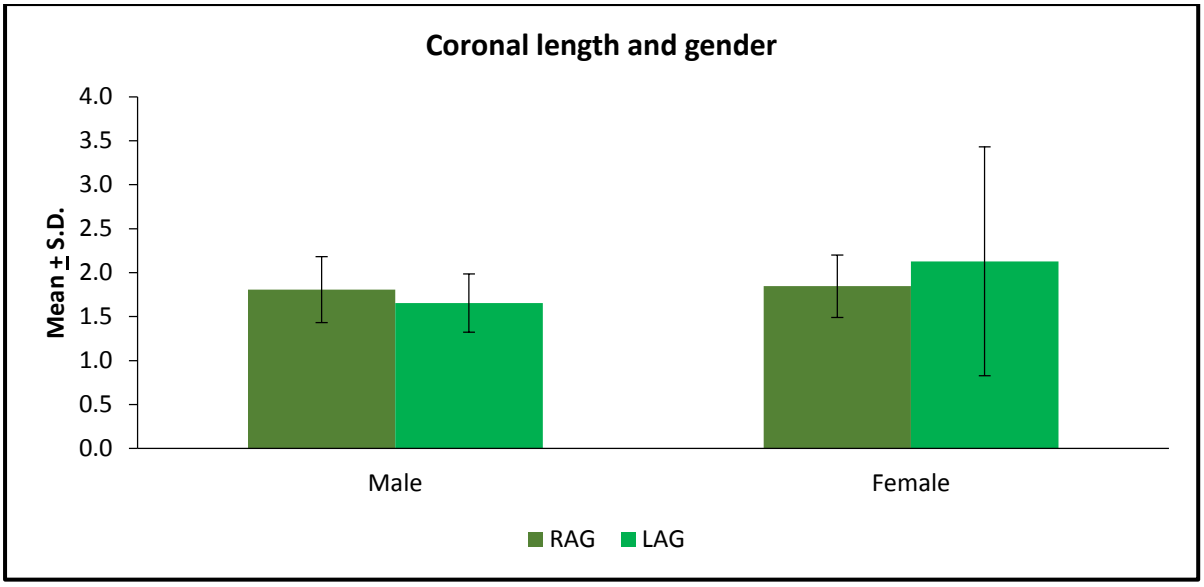
Graph 5.15: Max medial limbs and gender

Combined comparison of male and female for maximum medial limbs between RAG and LAG.



Graph 5.16: Total and gender

Combined comparison of male and female for maximum total thickness between RAG and LAG.



Graph 5.18: Coronal length and gender

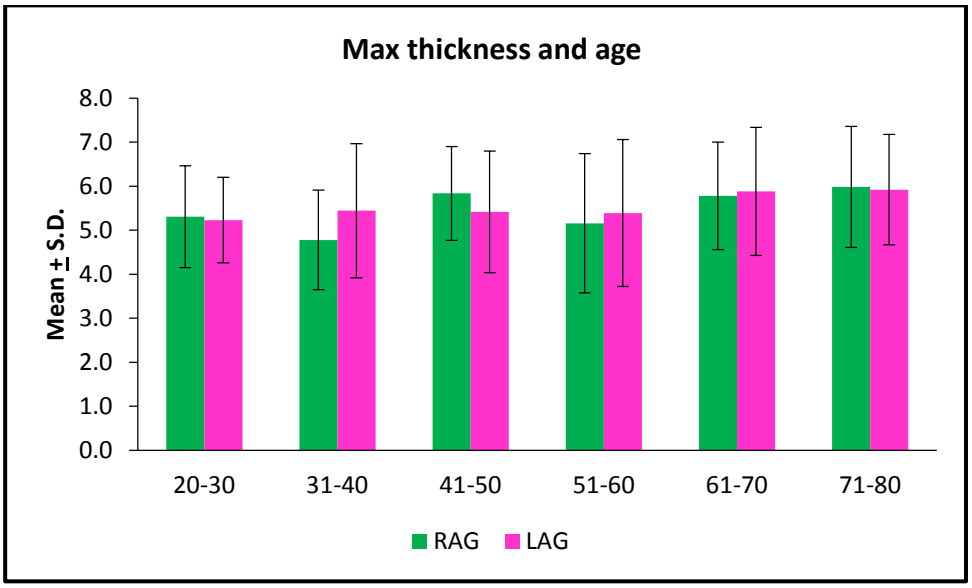
Combined comparison of male and female for coronal length between RAG and LAG.

Table 5.22: Max thickness of the adrenal gland between right and left sides according to age groups

Max thickness		Mean	S.D.	"t"	p value
20-30	RAG	5.3	1.2	0.236	0.816
	LAG	5.2	1.0		
31-40	RAG	4.8	1.1	-1.843	0.084
	LAG	5.4	1.5		
41-50	RAG	5.8	1.1	1.051	0.306
	LAG	5.4	1.4		
51-60	RAG	5.2	1.6	-0.459	0.652
	LAG	5.4	1.7		
61-70	RAG	5.8	1.2	-0.196	0.848
	LAG	5.9	1.5		
71-80	RAG	6.0	1.4	0.081	0.939
	LAG	5.9	1.3		

Max thickness of RAG and LAG for each age group.

The Paired "t" test was used to compare max thickness of the adrenal gland between right and left sides according to age groups. There was no difference ($p > 0.05$) in max thickness of the adrenal gland between right and left sides according to age groups.



Graph 5.19: Max thickness and age

Combined comparison of max thickness for RAG and LAG for each age group.

Table 5.23: Max lateral limbs of the adrenal gland between right and left sides according to age groups

Max lateral limbs		Mean	S.D.	"t"	p value
20-30	RAG	2.7	0.7	-3.611	0.001*
	LAG	3.4	0.8		
31-40	RAG	2.7	0.5	-4.140	0.001*
	LAG	3.7	0.8		
41-50	RAG	2.9	0.8	-3.070	0.006*
	LAG	3.6	1.1		
51-60	RAG	2.8	0.7	-2.286	0.035*
	LAG	3.3	0.7		
61-70	RAG	3.1	1.0	-1.423	0.180

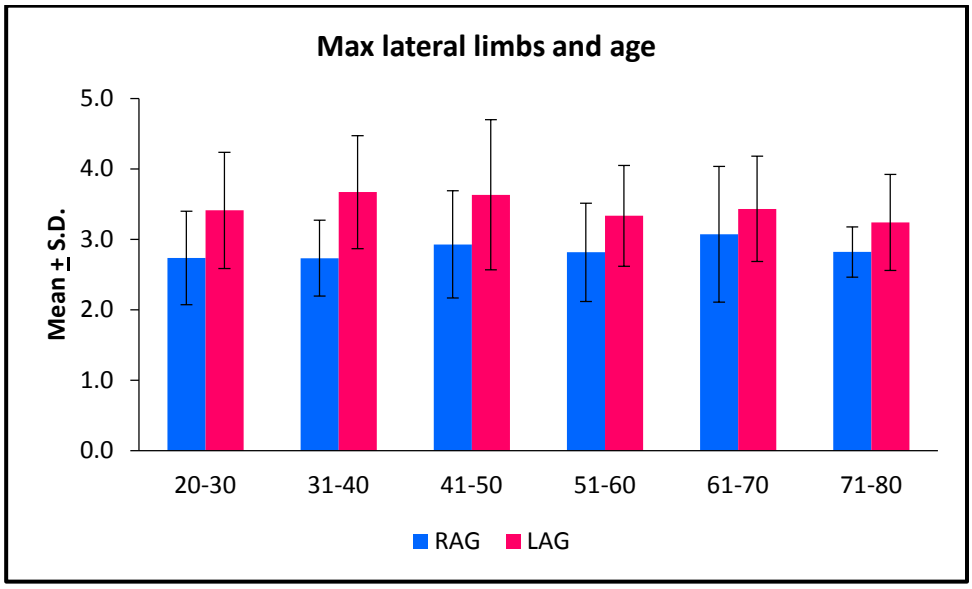
	LAG	**3.4**	**0.7**		
71-80	**RAG**	**2.8**	**0.4**	**-1.753**	**0.154**
	LAG	**3.2**	**0.7**		

(* Significant)

Max lateral limb comparison for RAG and LAG in each age group.

The Paired "t" test was used to compare max lateral limbs of the adrenal gland between right and left sides according to age groups. There was a difference ($p < 0.05$) in max lateral limbs of the adrenal gland between right and left sides for the age groups: 20-30, 31-40, 41-50, and 51-60 years.

- **In female as compare RAG AND LAG is greater (MAX LATERAL LIMB) but it is same in both gender**



Graph 5.19: Max lateral limbs and age

Combined comparison of Max lateral limbs for RAG and LAG for each age group.

Table 5.24: Max medial limbs of the adrenal gland between right and left sides according to age groups

Max medial limbs		**Mean**	**S.D.**	**"t"**	**p value**
20-30	**RAG**	**2.6**	**0.8**	**-2.251**	**0.034***
	LAG	**3.0**	**0.8**		
31-40	**RAG**	**2.8**	**0.9**	**-0.931**	**0.366**
	LAG	**3.1**	**0.9**		

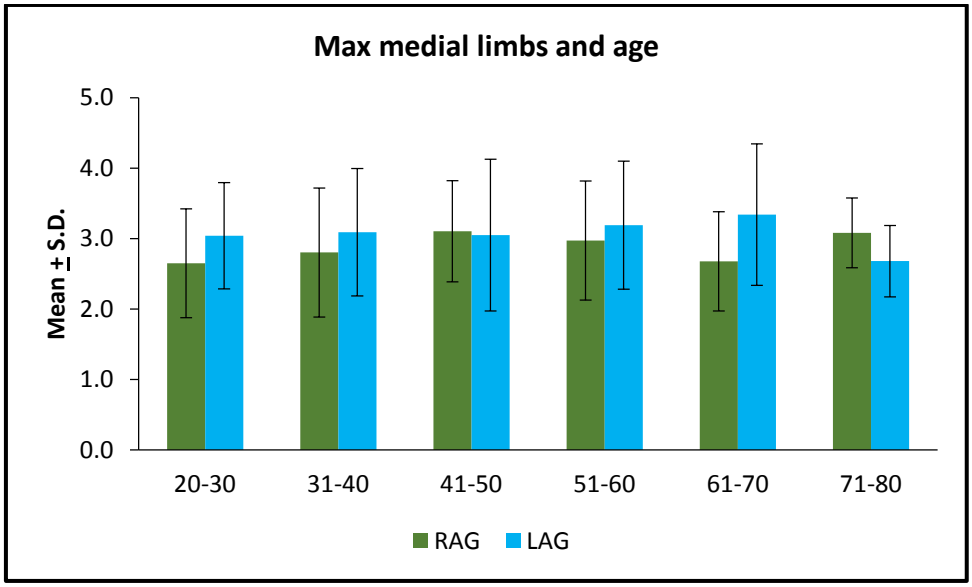
41-50	**RAG**	**3.1**	**0.7**	**0.186**	**0.854**
	LAG	**3.1**	**1.1**		
51-60	**RAG**	**3.0**	**0.8**	**-0.806**	**0.431**
	LAG	**3.2**	**0.9**		
61-70	**RAG**	**2.7**	**0.7**	**-2.189**	**0.049***
	LAG	**3.3**	**1.0**		
71-80	**RAG**	**3.1**	**0.5**	**1.845**	**0.139**
	LAG	**2.7**	**0.5**		

(* Significant)

RAG and LAG compared age group wise for max medial limbs.

The Paired "t" test was used to compare max medial limbs of the adrenal gland between right and left sides according to age groups. There was a difference ($p < 0.05$) in max medial limbs of the adrenal gland between right and left sides for the age groups: 20-30 and 61-70 years.

- **In max medial limb has later (20-30) have least (60-70) year .**



Graph 5.20: Max medial limbs and age

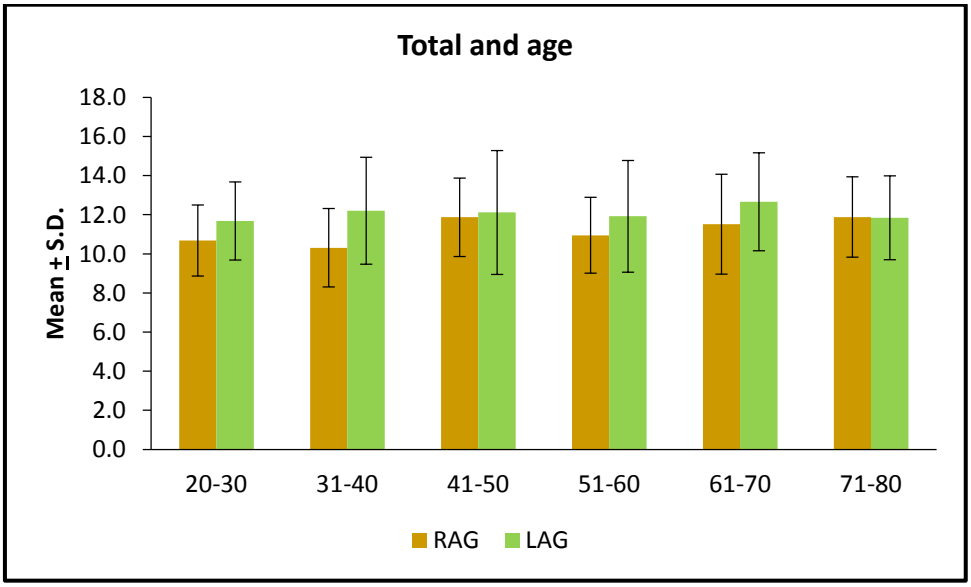
Combined comparison of max medial limbs for RAG and LAG for each age group.

Table 5.25: Normal thickness of the adrenal gland between right and left sides according to age

Total		Mean	S.D.	"t"	p value
20-30	RAG	10.7	1.8	-1.944	0.064
	LAG	11.7	2.0		
31-40	RAG	10.3	2.0	-2.637	0.018*
	LAG	12.2	2.7		
41-50	RAG	11.9	2.0	-0.335	0.741
	LAG	12.1	3.2		
51-60	RAG	10.9	1.9	-1.289	0.214
	LAG	11.9	2.9		
61-70	RAG	11.5	2.6	-1.343	0.204
	LAG	12.7	2.5		
71-80	RAG	11.9	2.1	0.046	0.966
	LAG	11.8	2.1		

(* Significant)

RAG and LAG compared age group wise for thickness of the adrenal gland between right and left sides



Graph 5.21: Total and age

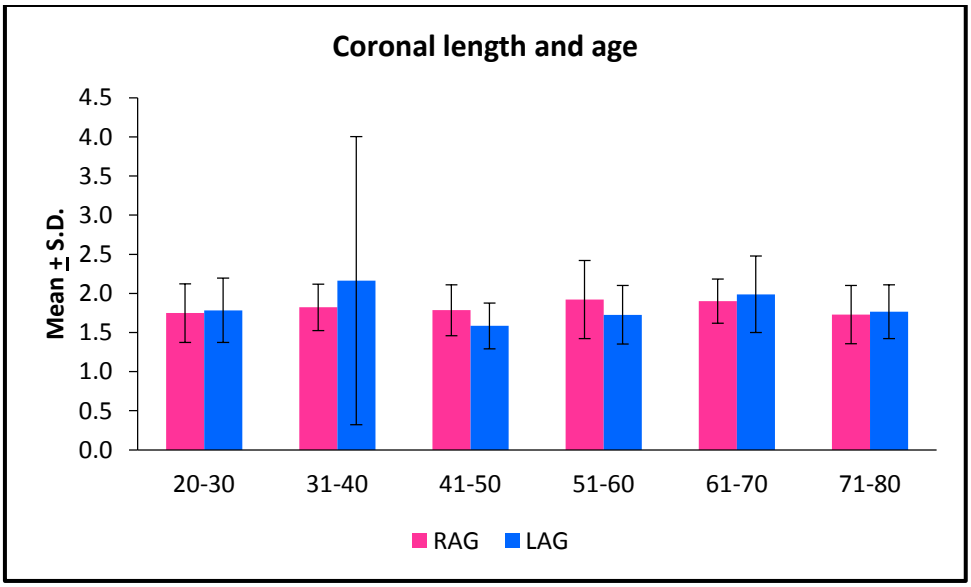
Combined comparison of total thickness for RAG and LAG for each age group.

Table 5.26: Coronal length of the adrenal gland between right and left sides according to age groups

Coronal length		Mean	S.D.	"t"	p value
20-30	RAG	1.7	0.4	-0.430	0.671
	LAG	1.8	0.4		
31-40	RAG	1.8	0.3	-0.733	0.474
	LAG	2.2	1.8		
41-50	RAG	1.8	0.3	2.726	0.013*
	LAG	1.6	0.3		
51-60	RAG	1.9	0.5	1.948	0.067
	LAG	1.7	0.4		
61-70	RAG	1.9	0.3	-0.708	0.493
	LAG	2.0	0.5		
71-80	RAG	1.7	0.4	-0.230	0.829
	LAG	1.8	0.3		

(* Significant)

RAG and LAG compared age group wise Coronal length of the adrenal gland between right and left sides



Graph 5.22: Coronal length and age

Combined comparison of coronal length for RAG and LAG for each age group.

Table 5.27: Relation between age BMI and Normal thickness (right side) of the adrenal gland

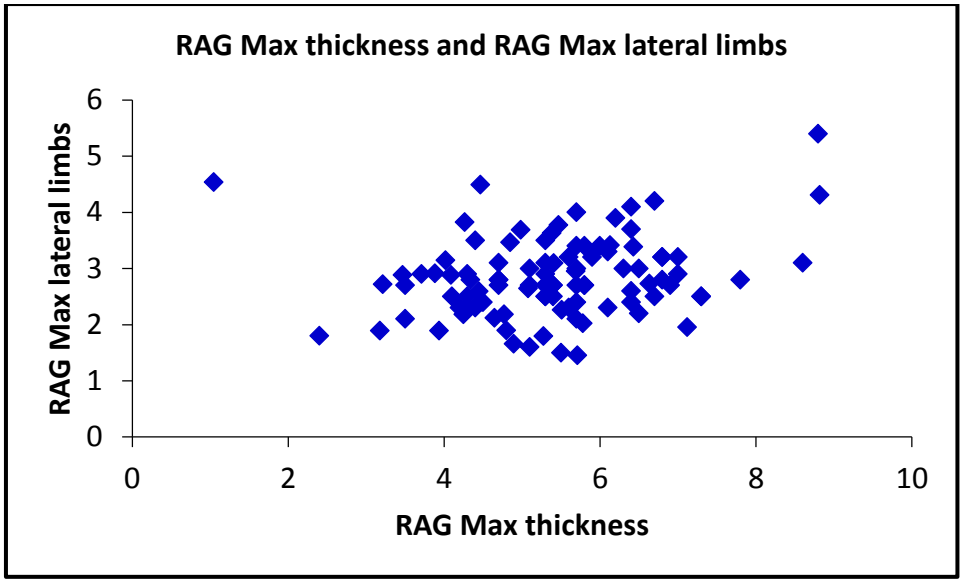
		Age	BMI Kg/M2)	RAG Max hickness	RAG lax lateral limbs	RAG Max edial limbs	RAG (Total)	RAG Coronal length
Age	"r"	1	-0.057	0.179	0.089	0.139	0.194	0.130
	p value	--	0.574	0.077	0.380	0.170	0.055	0.200
BMI (Kg/M2)	"r"		1	0.187	0.100	0.110	0.191	-0.107
	p value		--	0.065	0.326	0.278	0.058	0.292
RAG Max thickness	"r"			1	0.233	0.310	0.817	0.024
	p value			--	0.020*	0.002*	< 0.001*	0.815
RAG Max lateral limbs	"r"				1	0.425	0.646	0.109
	p value				--	< 0.001*	< 0.001*	0.282
RAG Max medial limbs	"r"					1	0.719	0.013
	p value					--	< 0.001*	0.899
RAG (Total)	"r"						1	0.058
	p value						--	0.572
RAG Coronal length	"r"							
	p value							--

(* Significant)

Shows the relationship of BMI and normal thickness if right size of adrenal gland.

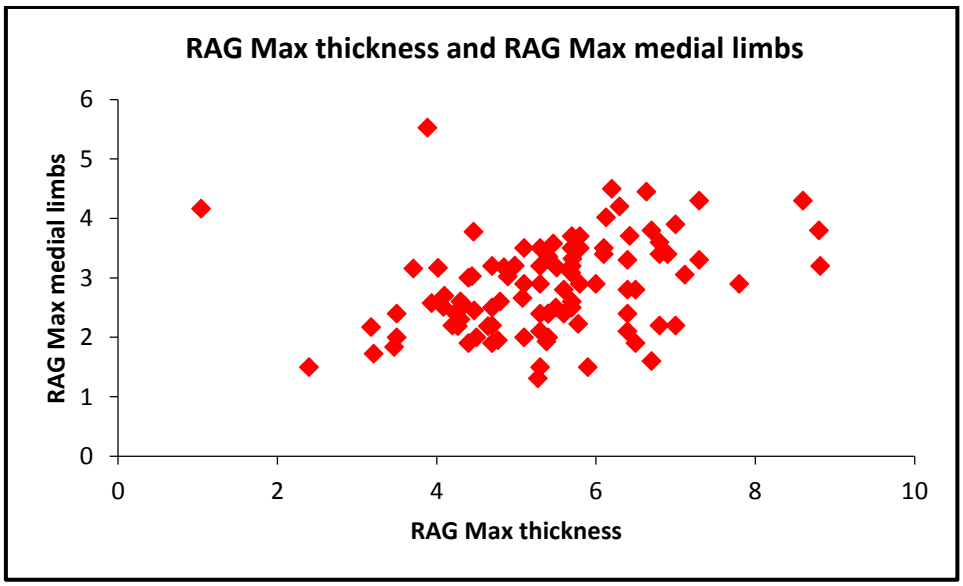
The Pearson correlation coefficient, "r" was used to find the relation between age BMI and normal thickness (right side) of the adrenal gland. Max thickness was positively correlated ($p < 0.05$) with max lateral limbs, max medial limbs, and the total. Also, max lateral limb was positively correlated ($p < 0.05$) with max medial limbs and the total.

- **Max thickness was positively correlated with max lateral limbs, max medial limbs, and the total**.



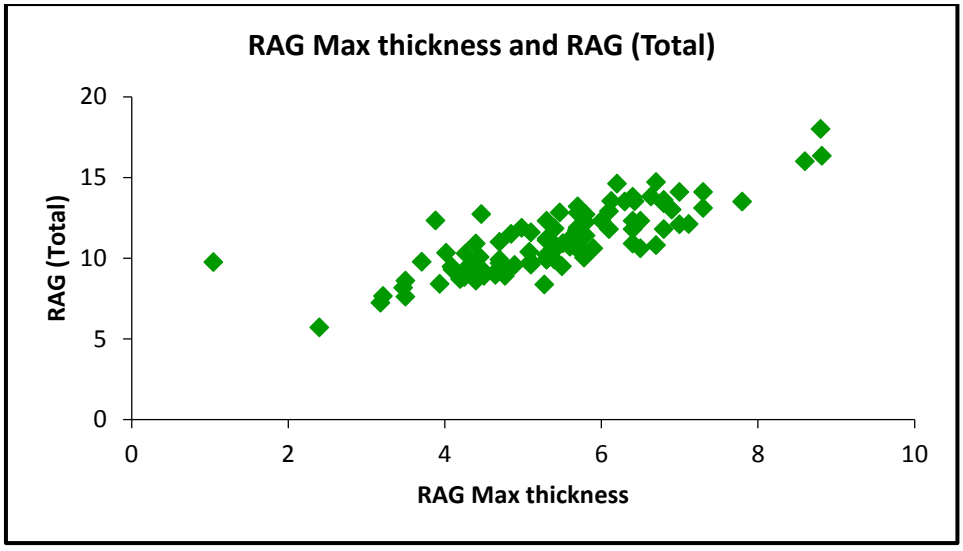
Graph 5.23: RAG Max thickness and RAG Max lateral limbs

RAG max lateral limb value is constant for increasing RAG Max thickness.

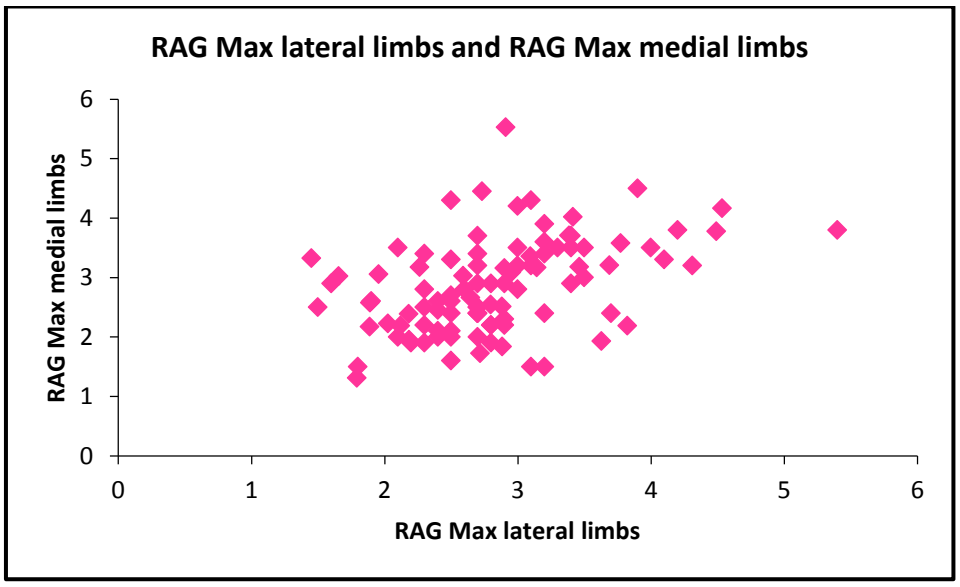


Graph 5.24: RAG Max thickness and RAG Max medial limbs

RAG max medial limbs is in a specific range of values for increasing RAG max thickness

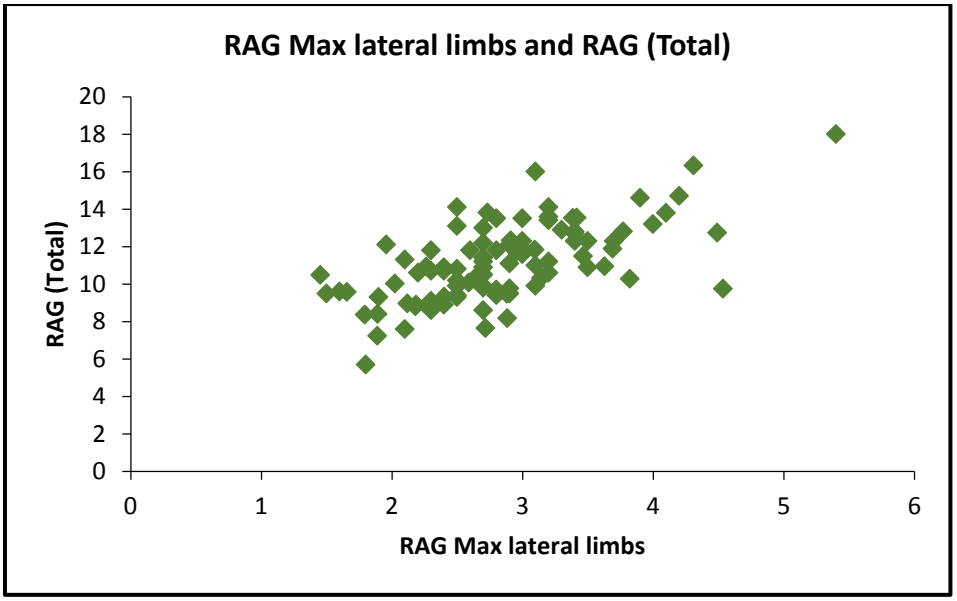


Graph 5.25: RAG Max thickness and RAG (Total)
RAG total has a range of constant values for increasing RAG Max thickness



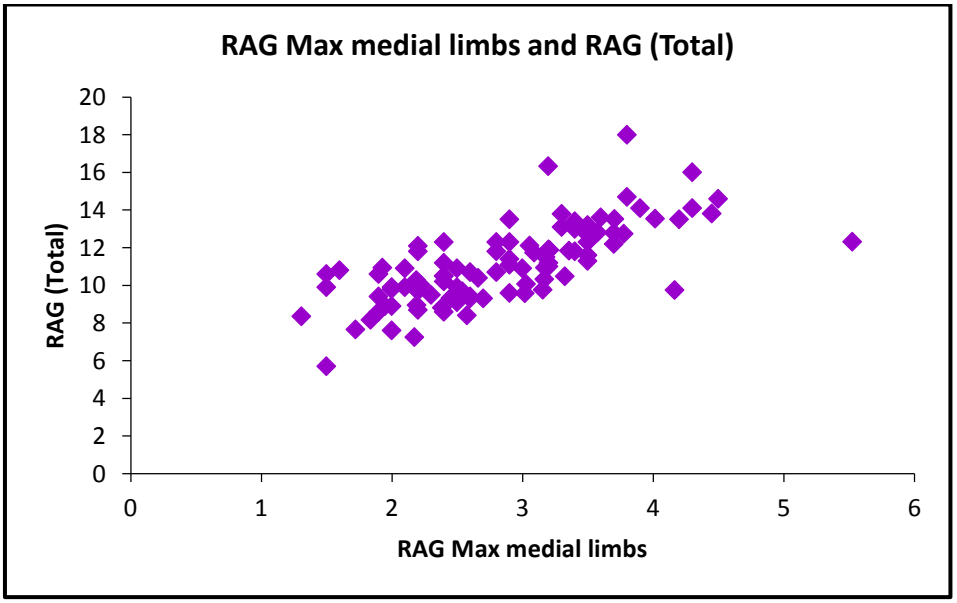
Graph 5.26: RAG Max lateral limbs and RAG Max medial limbs

RAG Max lateral limbs are directly proportional to RAG max medial limbs.



Graph 5.27: RAG Max lateral limbs and RAG (Total)

RAG Max lateral limbs are directly proportional to RAG (total).



Graph 5.28: RAG Max medial limbs and RAG (Total)

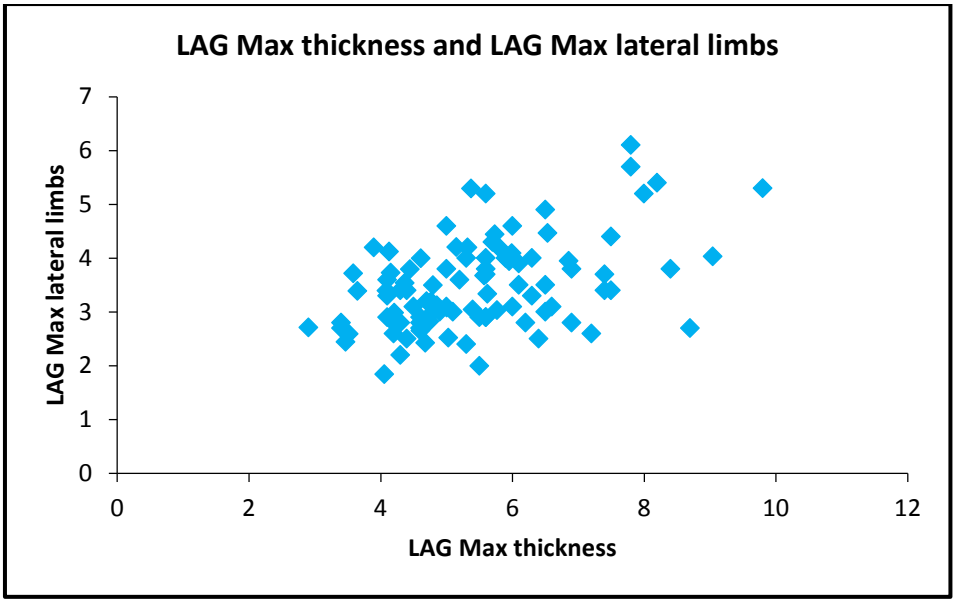
RAG Max medial limbs are directly proportional to RAG total.

Table 5.28: Relation between age BMI and Normal thickness (left side) of the adrenal gland

		Age	BMI Kg/M2)	AG Max hickness	AG Max lateral limbs	AG Max medial limbs	LAG (Total)	LAG Coronal length
Age	"r"	1	-0.057	0.156	-0.029	0.037	0.086	-0.027
	p value	--	0.574	0.124	0.775	0.713	0.396	0.788
BMI (Kg/M2)	"r"		1	0.036	0.136	0.009	0.068	-0.060
	p value		--	0.724	0.180	0.931	0.504	0.554
LAG Max thickness	"r"			1	0.483	0.525	0.866	-0.059
	p value			--	< 0.001*	< 0.001*	< 0.001*	0.563
LAG Max lateral limbs	"r"				1	0.634	0.796	0.093
	p value				--	< 0.001*	< 0.001*	0.360
LAG Max medial limbs	"r"					1	0.828	0.023
	p value					--	< 0.001*	0.820
LAG (Total)	"r"						1	0.007
	p value						--	0.949
LAG Coronal length	"r"							1
	p value							--

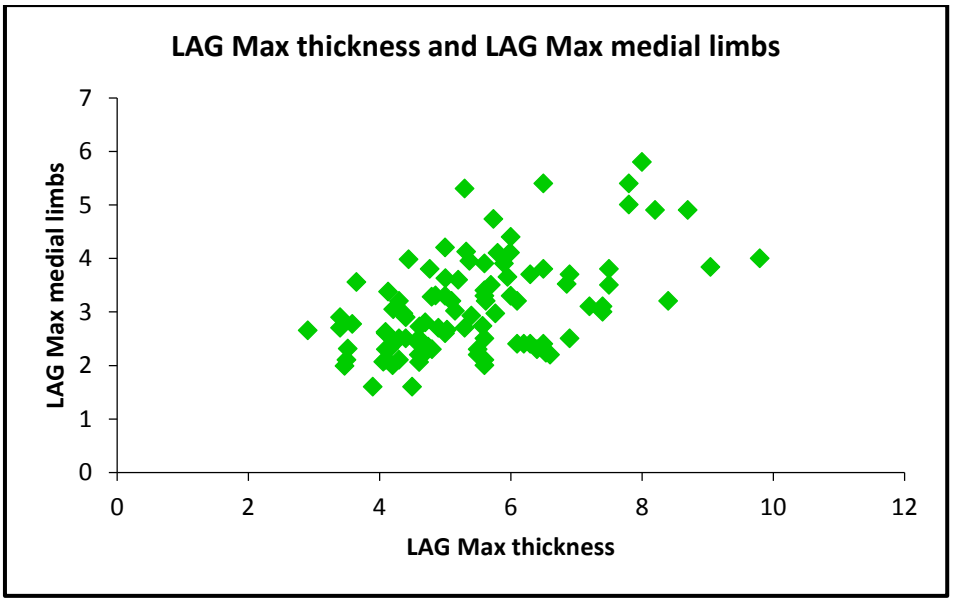
Normal Thickness and BMI of adrenal gland and relationship of their parameters.

The relationship between age, body mass index (BMI), and the normal thickness (left side) of the adrenal gland was discovered using the Pearson correlation coefficient, or "r". Max lateral limbs, max medial limbs, and max thickness all showed favourable correlations (p 0.05). Moreover, the maximum lateral limb and the total had a positive correlation (p 0.05). There was a correlation between the maximum medial limbs and the left side's total.Max thickness was positively correlated max lateral limbs, max medial limbs, and the total.



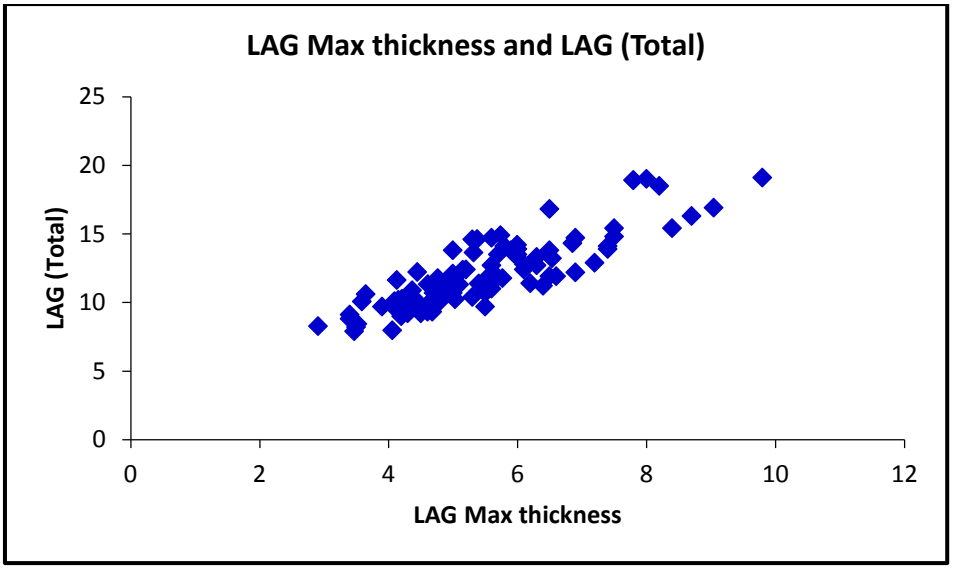
Graph 5.29: LAG Max thickness and LAG Max lateral limbs

LAG Max lateral limb is increasing gradually increasing Max thickness



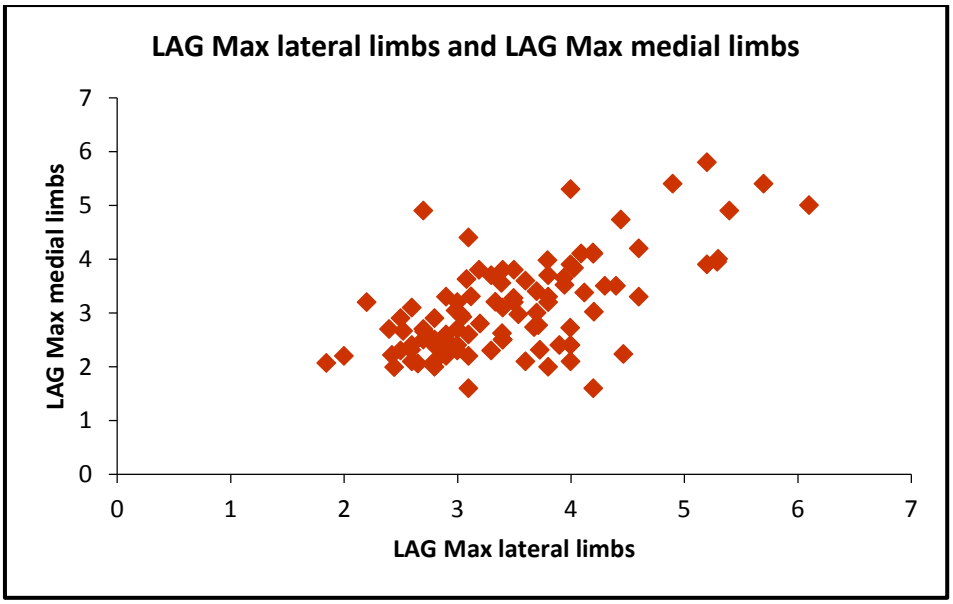
Graph 5.30: LAG Max thickness and LAG Max medial limbs

LAG Max thickness directly personal to LAG Max medial limbs



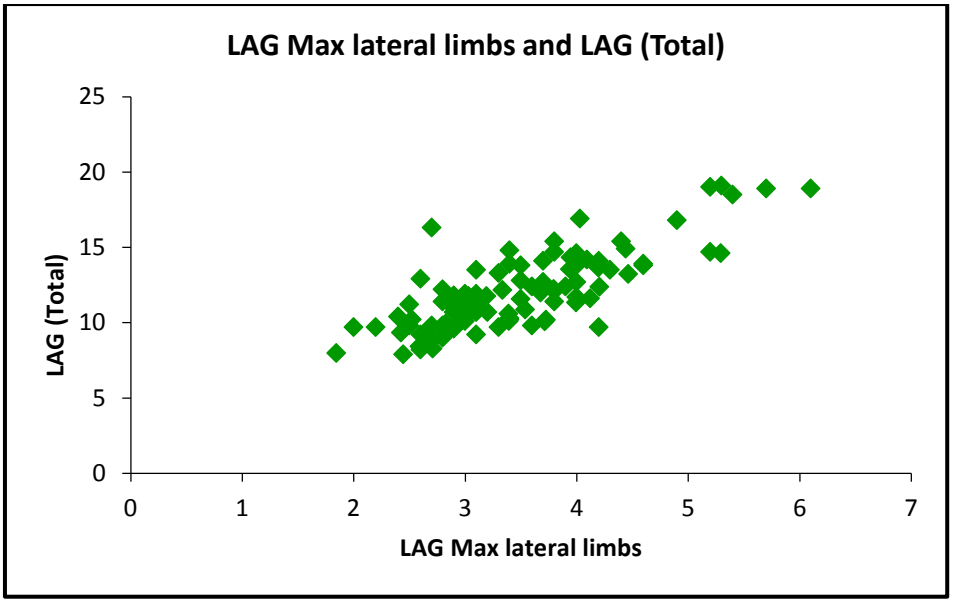
Graph 5.31: LAG Max thickness and LAG (Total)

LAG total shows increase with increase in LAG Max Thickness but stays constituent



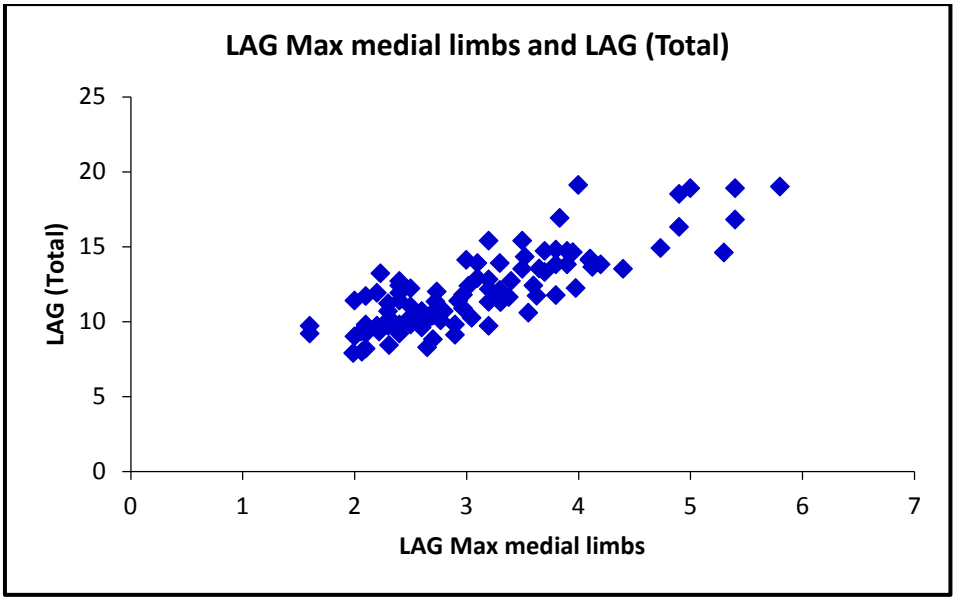
Graph 5.32: LAG Max lateral limbs and LAG Max medial limbs

LAG Max lateral limbs directly personal to each other



Graph 5.33: LAG Max lateral limbs and LAG (Total)

LAG Max lateral shows increase with and LAG (Total) but stays constituent



Graph 5.34: LAG Max medial limbs and LAG (Total)

LAG Max medial shows increase with and LAG (Total) but stays constituent

Table 5.29 :The different adrenal gland measurements on CT in all study subjects (n=100)

Thickness of adrenalgland	Right adrenal gland		Left adrenal gland		P Value
	Mean thickness in mm	Standard deviation	Mean thicknessin mm	Standard deviation	
Body	5.4	1.3	5.5	1.4	<0.001
Medial limb	2.9	0.8	3.1	0.9	
Lateral limb	2.8	0.7	3.5	0.8	
Total	11.1	2.1	12.0	2.6	
Coronal length	1.8	0.4	1.8	0.8	

All the parameters of adrenal gland (left and right) compared.

Table 5.30: The adrenal gland measurements in males (n=65) and females (n=35)

Thickness of adrenal gland	Right adrenal gland		Left adrenal gland		P Value
	Mean thickness in mm	Standard deviation	Mean thickness in mm	Standard deviation	
Males					
Body	5.3	1.3	5.4	1.3	<0.001
Medial limb	2.9	0.8	3.1	0.8	
Lateral limb	2.9	0.7	3.5	0.8	

Total	**11.0**	**2.0**	**12.0**	**2.3**	
Coronal length	**1.8**	**0.4**	**1.7**	**0.3**	
	Females				
Body	**5.6**	**1.2**	**7.83**	**1.81**	**<0.001**
Medial limb	**2.8**	**0.7**	**3.2**	**1.0**	
Lateral limb	**2.8**	**0.8**	**3.5**	**0.9**	
Total	**11.2**	**2.2**	**12.2**	**3.1**	
Coronal length	**1.8**	**0.4**	**2.1**	**1.3**	

Compared male and female values of right and left adrenal gland.

RESULTS

The research's subjects ranged in age from 20 to 80 years, with an average age of 45.6 45.7 yrs. The investigation involved a total of 35 girls and 65 boys. The mean and standard deviation for every dimension of the adrenal glands obtained from the CT scan are presented in (Table 5.29). The right adrenal gland's maximal diameter overall was 11.1 2.1mm. Right adrenal gland body, medial limb, and lateral limb mean absolute thicknesses were 5.4 1.3 mm, 2.9 0.8 mm, and 2.8 0.7 mm, respectively, and coronal length was 1.8 0.4 mm. The total maximum thickness of the left adrenal was 12.0 ± 2.6mm. The mean maximum thickness of the left adrenal gland body, medial limb, and lateral limb, coronal length were 5.5 ± 1.4mm, 3.1 ± 0.9mm and 3.5 ± 0.8 mm 1.8 ± 0.8 respectively.

The mean cumulative sizes of the right and left adrenal glands in men and women were 11.0 2.0 mm and 11.2 2.2 mm, respectively, and 12.0 3.1 mm and 12.0 3.1 mm, respectively.

CHAPTER 6

DISCUSSION

The word "thick and heavy adrenals," which is unclear but frequently used in CT results, leaves both the presenting doctor and the radiologist unsure of what this finding signifies for the subject. While using phrase lacks impartiality in addition. In order to effectively and checkings patients with suspected adrenal pathology in their regular practise, radiologists must be familiar with the typical thickness of the adrenal glands. Therefore, we think that a study of this kind will have a significant impact on determining a patient's adrenal gland size or atrophic status objectively.

Dr. Shilpa Devakar, et al conducted a study in which they in which she found that there was a difference in maserment of left and right AG the left was being larger than right simllilarey in our study the left AG was larger than right . But in our study. Males and females had mean cumulative right adrenal gland sizes of 11.0 2.0 mm and 11.2 2.2 mm, respectively, while males and females had mean cumulative left adrenal gland sizes of, respectively 12.0 ± 3.1.[6]

Enes Gurun, et al conducted a study in which they conclude The rise in BMI, one of the indices of obesity, is associated to the rise in AGV, another why the BMI correlation must be taken aspect while AG . But in our study. The average cumulative right adrenal gland measures in both men and women were 11.0 ± 2.0mm and 11.2 ± 2.2 mm, respectively and the mean cumulative left adrenal gland size in males and females were 12.0 ± 3.1 respectively.[7]

Le-le Li, et al conducted a study in which they conclude that A common radiology result, incidental adrenal enlargement is associated with a variety of clinical variables that necessitate adequate diagnostic assessment and care. Nodular adrenal hypertrophy was discovered to be a separate risk factor during operational assessment. But in our study. The average cumulative sizes of the right and left adrenal glands in men and women were 11.0 2.0 mm and 11.2 2.2 mm, respectively, and 12.0 3.1 mm and 12.0 3.1 mm, respectively.[11]

Li, et al. analysed the functional status of unintentionally enlarged adrenal glands and found that only 3 of the 39 patients had preclinical metabolic problems, whereas 35 of the 39 patients with smoothly enlarged adrenal glands had normal metabolic effectiveness. This demonstrates the patient population with incidentally discovered smoothly enlarged adrenal glands has a rather

low incidence of subclinical biochemical abnormalities. It's debatable if we can link ethnicity to the high prevalence of inadvertently enlarged adrenal glands. At the very least, it could be necessary to use distinct reference standards for various groups of people. We advise radiologists to utilise our data as a guide for their everyday work and as a useful baseline reference range for the Asian Indian adult population.Demonstrating a slight to medium positive connection between the participant's age and different measures of the adrenal glands. John et al. investigation of the CT adrenal size In reported in the Indian Journal of Radiology and Imaging, they use the phrase "diffuse smoothly expanded" or "bulky" to describe an uncertain adrenal gland. Because this study was retrospective in nature, patient height and weight were not provided, so we were unable to compare the size of the adrenal glands to these factors. We also emphasise the need for sizable multiethnic population-based research to create a criterion that is recognised globally.

CHAPTER -7

CONCLUSION

The conclusion of this study lead us to advise physicians to consider our data as a baseline reference range for the Western population and as an indicator when they encounter unclear "bulky" or "diffuse smoothly expanded" AG.

CHAPTER -8

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F. No. SU/R/2024/2425[2] Dated: 07.09.2024

Subject: Grant of Ethical Clearance for **Dissertation Protocol** Topic **"Assessment of the Normal Thickness of Adrenal Gland (MDCT) in Western UP Population",** submitted by **NAVNEET SINGH,** student of M.Sc. Medical Imaging Technology, 2022 Batch.

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With reference to the request for grant of Ethical Clearance for the Dissertation Protocol entitled **"Assessment of the Normal thickness of Adrenal Gland (MDCT) in Western UP Population"**, **NAVNEET SINGH** is informed that the **Dissertation Protocol** submitted by him/her was considered by the **Screening Committee** of the **Allied Health Sciences** in its meetings held on 07.02.2024 and 29.02.2024. The recommendations of the **Screening Committee** were considered in detail by the **Institutional Ethics Committee** in its meeting held on **15.05.2024** and the same was **approved** by the **Ethics Committee** of the **Santosh Deemed to be University, Ghaziabad, Delhi NCR**.

He /She is informed accordingly for further necessary action.

[Dr. EZHILRAJAN. K]
REGISTRAR

SANTOSH DEEMED TO BE UNIVERSITY ★ REGISTRAR ★ GHAZIABAD, N.C.R. DELHI

NAVNEET SINGH
M.Sc. Medical Imaging Technology.

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Assessment of the Normal thickness of Adrenal gland [MDCT] in western UP population

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